JUN 2 1947

ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION

MAY 29, 1947

WHAT ABOUT HIGH CONSTRUCTION COSTS?

AN ENR REPORT

It makes a culvert "open its mouth"

Corrugated metal culverts gain added efficiency—as well as safety, economy and beauty—with the new ARMCO End Section. On the upstream end the flared design reduces entrance loss—gulps more water faster. Downstream it retards undermining and undercutting.

ARMCO End Sections meet all requirements for present-day road design. They fit the slope to blend perfectly with any landscaping treatment. There are no obstructions above the shoulder grade—an important safety factor — and nothing to interfere with maintenance operations, such as mowing and snow removal.

This is another example of how Armco has cooperated with engineers and contractors in developing products to meet specific drainage and construction needs. For more than 40 years Armco drainage engineers have pioneered in combating erosion and corrosion; speeding installation time; providing greater safety and economy at every turn.

These are some of the reasons why you'll be time and money ahead by bringing your drainage and construction problems to Armco. Knowledge gained from years of experience, plus cumulative data from thousands of installations and field and laboratory tests, is available for the asking. Usually there are case histories in every field—highway, railway, airport, municipal or industrial. Why not talk over your requirements with one of our specialized Armco engineers.

ARMCO

ARMCO DRAINAGE & METAL PRODUCTS, INC.

MIDDLETOWN, OHIO • DIVISION OFFICES IN THE FOLLOWING CITIES

Berkeley, California ★ Middletown, Ohio ★ Atlanta, Georgia ★ Baltimore, Maryland
Denver, Colorado ★ Des Moines, Iowa ★ Topeka, Kansas ★ Minneapolis, Minnesota
Portland, Oregon ★ South Bend, Indiana ★ Houston, Texas ★ Washington, D. C.

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewerage, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Airports, Irrigation, Canals, Tunnels, Railroads

Volume 138 • Number 22

May 29, 1947

ALBERT E. PAXTON..........*Publisher*

WALDO G. BOWMAN...........*Editor*

EDWARD J. CLEARY....*Executive Editor*

•

ASSOCIATE EDITORS—V. T. Boughton, R. K. Tomlin, H. W. Hunt *(New York)*, V. B. Smith *(Chicago)*, J. R. Carr *(Cleveland)*, N. A. Bowers *(San Francisco)*, A. N. Carter *(Washington)*

ASSISTANT EDITORS—F. S. Merritt, John C. Bumstead *(New York)*; L. L. Wise *(San Francisco)*

NEWS: EDITORS—E. E. Halmos, Jr. and T. D. MacGregor

STAFF ASSISTANTS—Ethel Lyon, Helen McCord

BUSINESS NEWS—Elsie Eaves, *manager*, J. A. Mahoney, E. R. Biggerstaff, Marie W. Roessler

ENGINEERING NEWS-RECORD

Published By
McGRAW-HILL PUBLISHING CO., INC.

Publication Office:
99-129 N. Broadway, Albany 1, N. Y.

Editorial and Executive Office:
330 W. 42nd St., New York 18, N. Y.

FEATURES IN THIS ISSUE

News of the Week.. 37

Editorials 46

Biggest Sewage Works in the West................................ 48

Trusses With Welded Joints Tested................................ 52

Friction Effects in River Models..................T. A. EPSTEIN 54

What Can Be Done About High Construction Costs.............. 55

Water Pipeline on the Desert Floor................................ 63

Joint Leakage Stopped at Marshall Ford Dam........W. B. BIERCE 66

Tests of Eccentric Split-Ring Joints..................R. H. GLOSS 69

DEPARTMENTS

Construction Trends 35

Comment and Discussion....... 71

Unit Prices 74

New Aids 77

Men and Jobs................ 80

Elections and Activities........ 88

Manufacturers' Activities 97

Manufacturers' Publications 101

Construction Reports 125

Number of Copies of this issue printed 43,464

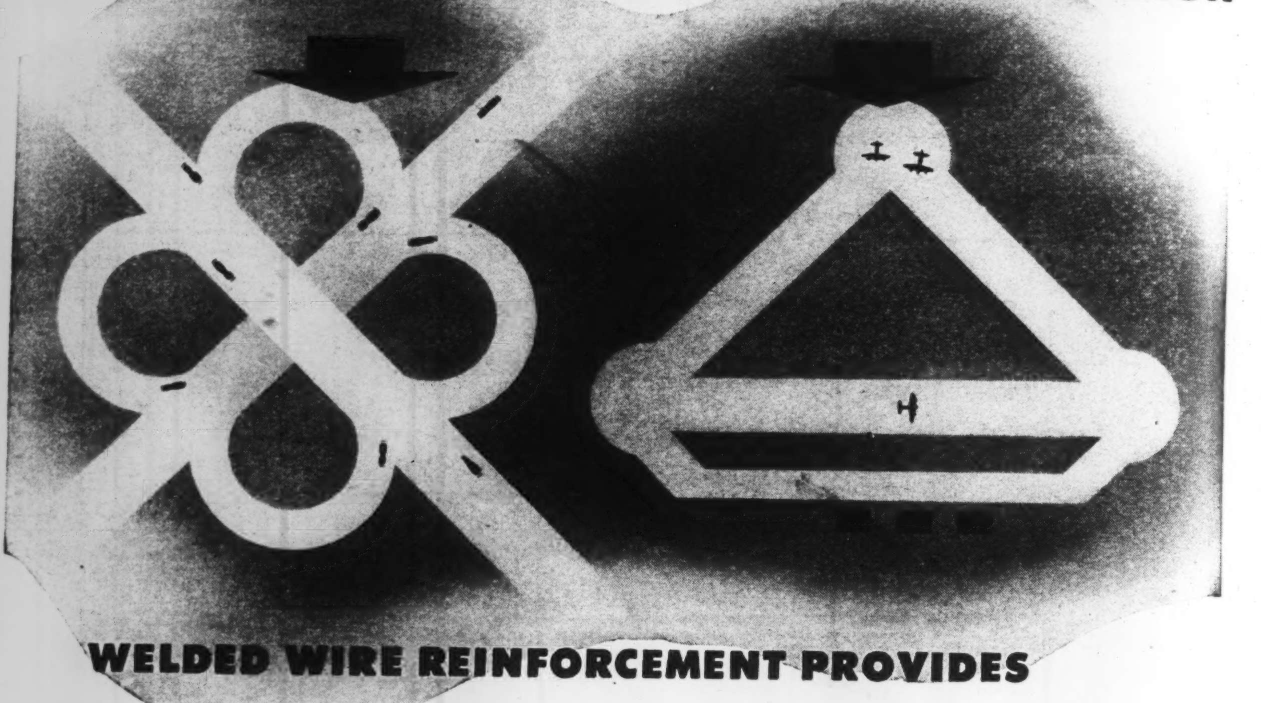
A 16-YEAR CONSOLIDATED INDEX

A consolidated index of Engineering News-Record covering the years 1928-1943 inclusive is now available. This 414-page book lists all articles published during those years and all news items except those of ephemeral nature. Its price is $8. Copies can be obtained by sending this coupon with a check or money order to:

THE EDITOR, ENGINEERING NEWS-RECORD
330 West 42 St., New York 18, N. Y.

ENGINEERING NEWS-RECORD. Published every Thursday. **Return postage guaranteed.** Vol. 138, No. 22. Price 35c per copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd Street, New York 18, N. Y. Subscriptions, United States and U. S. Possessions, $6.00 for one year, $9.00 for two years, $12.00 for three years. Canada $7.00 for one year, $11.00 for two years, $14.00 for three years. Latin American countries $10.00 for one year, $16.00 for two years, $20.00 for three years. All other countries, $20.00 for one year, $30.00 for two years, $40.00 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter October 29, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U.S.A. Cable Address: "McGraw-Hill New York." Member A.B.P. Member A.B.C. Copyright 1947 by McGraw-Hill Publishing Company, Inc. All rights reserved. James H. McGraw, Founder and Honorary Chairman; JAMES H. McGRAW, JR., President; CURTIS W. McGRAW, Senior Vice-President and Treasurer; JOSEPH A. GERARDI, Secretary; NELSON BOND, Director of Advertising; EUGENE DUFFIELD, Editorial Assistant to the President; and J. E. BLACKBURN, JR., Director of Circulation. **Publication office: 99-129 North Broadway, Albany 1, N. Y. Editorial and Executive Office: 330 West 42nd St., New York 18.** District Managers and Branch Offices: Fred G. Hudson and L. H. Hunt, 520 N. Michigan Ave., Chicago 11; 738-39 Oliver Building, Pittsburgh; J. W. Otterson, 68 Post St., San Francisco 4; Aldwych House London, W. C. 2, England; Washington; J. M. Spackman, New York; A. B. Cozzens, Philadelphia; E. E. Duff, Jr., Cleveland; B. F. Horn, Detroit; W. E. Donnell, St. Louis; R. N. Phelan, Los Angeles; W. G. Payne, Boston; Ralph Maultsby, Atlanta, Ga.

IN CONCRETE HIGHWAY AND RUNWAY CONSTRUCTION



WELDED WIRE REINFORCEMENT PROVIDES

Greater Resistance

- To cracking due to shrinkage of concrete during setting period.
- To cracking caused by expansion and contraction of subgrade.
- To cracking due to heavy traffic loads.
- To cracking and spalling due to temperature changes.
- To cracking due to yielding subgrades.

Because the high tensile strength of welded wire reinforcement — resists strains — prevents formation of visible cracks — provides controlled flexibility in slabs.

And for concrete reinforcement at its best — choose one of these three famous, high quality brands of

Welded Wire Fabric

CLINTON
WICKWIRE SPENCER STEEL
14 Lafayette Sq., Buffalo, N. Y.

CALWICO
THE CALIFORNIA WIRE CLOTH CORP.
1001 22nd Ave., Oakland, Cal.

COLORADO
THE COLORADO FUEL & IRON CORP.
Continental Oil Bldg., Denver, Colo.

CF&I

Construction Trends

Construction Volume Improves in May

Volume of heavy engineering construction contracts awarded has shown a slight improvement in May. The previous four-week moving average of construction contracts of $110,529,000 at the end of May showed a rise of 4 percent from the April average of $106,546,000, as recorded by *Engineering News-Record.* Although the May, 1947 average was still 9 percent below the four-week moving average of $122,097,000 for May, 1946, it was 255 percent above the comparable average for May, 1945.

A strong upward trend in contract volume was evident in February and March of 1947. The previous four-week moving average rose to $89,825,000 in February and to $107,997,000 in March, or 45 percent and 25 percent, respectively, above the corresponding periods a year ago. The April, 1947 average of $106,546,000, however, declined 1 percent from the March average, while a rise of 56 percent was evident from March to April of last year.

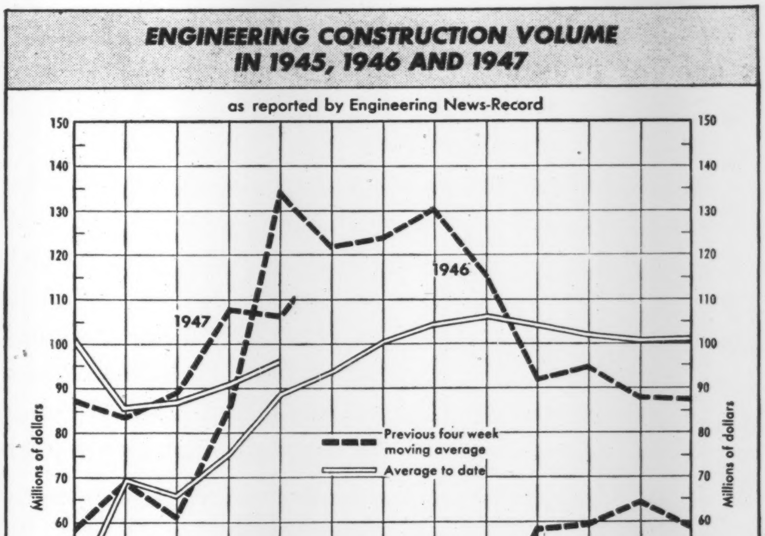
The cumulative total of construction contract awards, totaling $2,084,464,000 during the first twenty-one weeks of 1947, showed a gain of 4 percent over the $2,004,862,000 awarded in the corresponding period a year ago. This compares with a rise of 24 percent at the end of January over a year ago and 32 perpercent at the end of February.

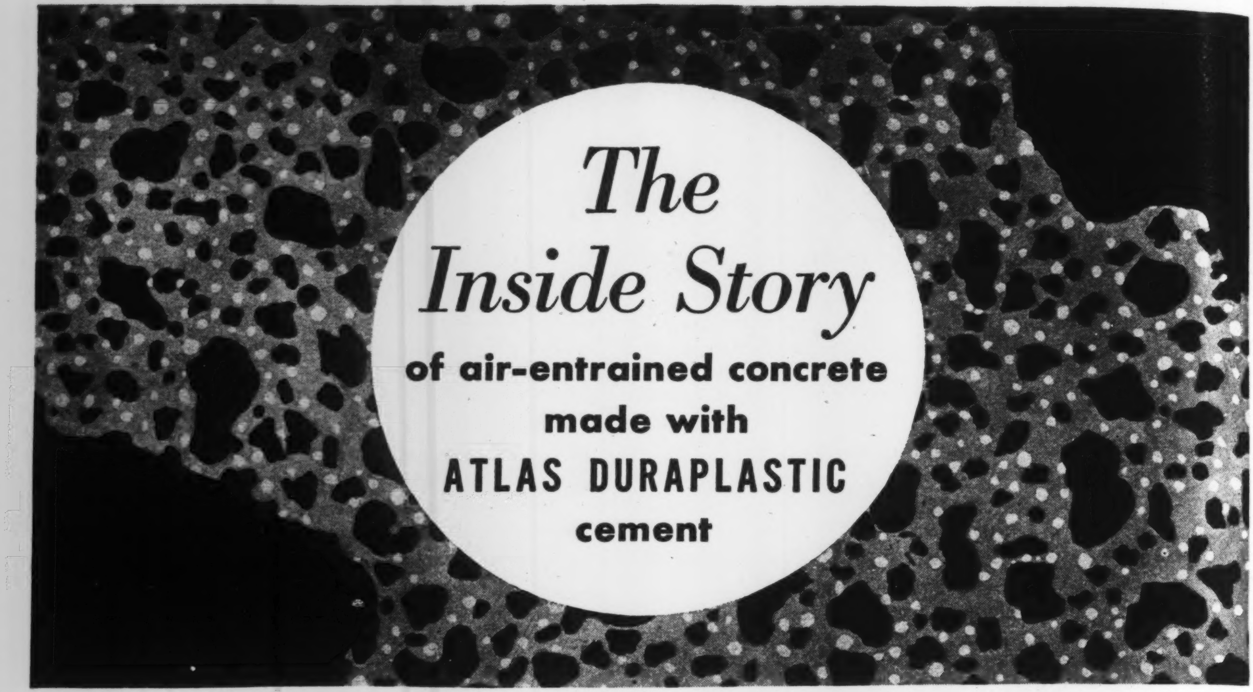
The cumulative totals at the end of March and April, 1947, compared with corresponding periods a year ago, lost the relative advantage maintained in earlier months. The total of $1,187,876,000 at the end of March this year was 21 percent above a year ago, and the total at the end of April, 1947 of $1,642,347,000 was 8 percent above the 1946 total.

The rise in contracts awarded at the end of May was not sufficient to affect the trend. The cumulative total through the first 21 weeks of 1947, as previously indicated, showed a rise of only 4 percent over a year ago. As compared with the first 21 weeks of 1945, however, heavy construction contracts this year showed a gain of 214 percent.

Total public construction volume so far this year, rising 18 percent over the corresponding figure for 1946, accounted for the increase in overall construction volume figure which is shown on the chart.

The cumulative total for private construction contract awards so far in 1947, as compared with last year, showed a drop of 74 percent. State and municipal contracts rose 33 percent during this period of 1947 over the same period a year ago, while federal contract awards showed a decline of 9 percent. Public building contract awards, rising 93 percent over 1946, showed the greatest gain.





The Inside Story

of air-entrained concrete made with ATLAS DURAPLASTIC cement

A highly magnified section of Duraplastic concrete would look something like this. The two large black areas represent small portions of coarse aggregate; small black spots represent sand; gray area represents cement paste; white dots represent entrained air bubbles.

Duraplastic cement provides the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance.

It requires less mixing water and reduces segregation and bleeding.

It makes the concrete more workable, more plastic, more cohesive, more uniform and more durable.

For almost any type of concrete work, Duraplastic cement makes better concrete at no extra cost. It complies with ASTM and Federal specifications, and sells at the same price as regular cement.

Send for further information. Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: Albany, Birmingham, Boston, Chicago, Cleveland, Dayton, Des Moines, Duluth, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco.

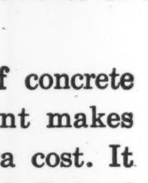
ENR-D-52

ATLAS DURAPLASTIC

TRADE MARK REG.
U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST



"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel—Sunday Evenings—ABC Network*

News of the Week

ENGINEERING NEWS-RECORD • MAY 29, 1947 • VOLUME 138 • NUMBER 22

Construction employment falling short of predictions

Bureau of Labor Statistics report shows increases but estimates peak will be below early forecast—New housing starts reported dropping under last year

Although employment in the construction industry showed a "moderate" gain of about 100,000 workers during April, the total employment on contract work is well below the expectations of federal agencies earlier in the year, according to a report by Ewan Clague, commissioner of the Bureau of Labor Statistics.

The announcement was coupled with a report from the Commerce Department's construction division which showed that starts of new housing construction lagged during April; but was lightened by a BLS statement that the peak in construction costs apparently is near.

Early in the year, BLS predicted that top on-site construction employment would reach 2,500,000 by the September peak in the construction season. Last week's report, however, estimated that the construction employment peak would be about 1,900,000 workers. Breaking this figure down, BLS said that total contract construction employment in April was 1,660,000. This figure was expected to go up to about 1,735,000 in May, 1,785,000 in June and 1,835,000 in July.

Evaluating these figures, the U. S. employment Service reported that there are no areas of the United States were "large" unemployment of construction workers exists, nor are there areas where construction labor is in extremely short supply. However, it was pointed out that in a few locations, the availability of specialized skills is "somewhat insufficient."

This report did not tally with independent reports reaching Engineering News-Record, which showed (*ENR* May 15, vol. p. 791) some 16,000 skilled mechanics idle in the New York metropolitan area alone.

Resistance to high prices, the fact that new residential construction has fallen behind schedule, and uncertainty concerning the business outlook for the remainder of the year were listed as factors retarding construction. These unfavorable conditions, however, appear to be offset somewhat by actual increases in some classes of new construction, and continued high output of materials, BLS said.

Totals revised downward

The Commerce Department's construction division in April reported that total new construction put in place this year is expected to be between $12,000,000,000 and $13,000,000,000—as compared to an earlier estimate of $15,000,000,000.

The most significant lag is in the start of new housing work. Only about 62,000 new permanent units were started in April, the latest month for which figures are available. This figure is an increase of 8,000 over March of this year, but a drop of 4.000 under April of 1946. The total for April, too, marked the third month in which starts fell below those for the corresponding month of last year. As a result, during the first four months of 1947, only 198,000 new privately financed dwellings were started in the entire U. S., compared with 205,000 for the same period last year.

Materials increase

A good report regarding the availability of construction materials is soon to be released by the construction division of the Department of Commerce. This report will reveal that the output of construction supplies during March—the last month for which complete figures are available—was about 8 percent above February. It further shows that the only large class of materials still in short supply is steel products—due, to a great extent, to the shortage of steel itself. Gypsum board and lath may continue somewhat tight for a few more months, but it is predicted that lumber, clay products, and soil pipe, which were extremely critical a few months ago, will be available in good quantity if the present high production levels are maintained.

One major indication that cost of construction supplies has about reached a peak is contained in the BLS weekly building materials wholesale price index. For the last several weeks, the in-

(*Continued on following page*)

Army contract seeks data on underground factories

The Corps of Engineers last week announced signing of a contract with Guy B. Panero—successor to Clyde R. Place, New York City consulting engineer—to "investigate the feasibility and cost of constructing and operating underground plants and storage sites."

The contract is another move in a long-range study being conducted by both the Army and the Navy into the cost and advisability of putting vital industries underground as a hedge against possible future attack. (*ENR* Feb. 27, vol. p. 347).

Mr. Panero and his staff recently prepared a complete report for the government on underground construction undertaken during the war to protect German industry.

House bill would aid public works planning

A bill (H. R. 3490) authorizing the expenditure of $50,000,000 by the Federal Works Agency to assist local public works groups in the preparation of plans for construction has been placed before the House by Congressman Muhlenberg of Pennsylvania. The proposal, which is an authorization only and appropriates no money at this time, provides no aid for housing.

The money could be used by the FWA as either loans or advances to public agencies. It is specifically stated in the bill that such aid would not commit Congress to appropriate funds to undertake construction of any jobs planned with federal assistance.

Funds would be allotted according to state population.

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Construction — Three industrial building projects involving $7,500,000 are proposed or under way in western Washington, including a $3,500,000 grain elevator and processing plant at *Tacoma*, a $2,000,000 expansion of an oil company terminal at *Seattle*, and a $2,000,000 addition to a paper mill at *Port Townsend*. . . . Leonard A. Peto has approval of the Office of the Housing Expediter to start work on a $2,500,000 sports building on the site of the old National League park in *Philadelphia, Pa*. . . . Barret Division of Allied Chemical Co. will build a $1,000,000 chemical plant at *Ironton, Ohio*. . . . Issuance of $15,000,000 in certificates of indebtedness has been approved for new construction for the municipal electric utility system at *Jacksonville, Fla*. . . . General Motors is receiving bids for $1,000,000 worth of construction at *Philadelphia, Pa*. . . . Plans for $12,000,000 expansion, including seven buildings, have been announced by Notre Dame University, *South Bend, Ind*. . . . Bond issues of $6,000,000 have been approved for schools in *Kern County, Calif*. . . .Fibreboard Products, Inc., San Francisco, Calif., has received federal approval to construct a sulphate pulp plant in *Contra Costa County, Calif.*, at an estimated cost of $2,836,000.

Highways—New construction of $2,000,000,000 annually can be expected in the future on highway work, C. M. Upham, engineer director of the American Road Builders Association, Washington, told the University of Florida Highway Conference in *Gainesville, Fla*. . . . The Cape May County Bridge Commission is asking bids for a $1,000,000 toll bridge at *Strathmere, N. J.*, and for reconstruction of the *Ocean City-Longport* bridge. . . . The Virginia highway department has announced a low bid of $723,237.31 for a 4-lane overpass over the Virginian Railway and Roanoake River at *Kumis, Va*. . . . *Florida's* highway program calls for reconstruction of 48,218 miles of highway during the next 15 years at an estimated cost of $100,000,000. . . . The public works department of the province of *New Brunswick, Canada*, has awarded contracts for 130 miles of roads involving expenditure of $4,000,000.

Housing — Collingswood Construction Corp. has begun work on a $1,200,000 apartment development at *Collingswood, N. J*. . . . Anthony P. Miller, Inc., has started a 200-residence development at *Pleasantville, N. J.*, to cost $2,000,000. . . . A contract has been awarded for a $1,000,000 Palm Villa Hotel in *Phoenix, Ariz.*, and in the same city plans are disclosed for a $500,000 multiple - unit apartment house. . . . A 200-residence, $2,000,000 development is to be built by the Philadelphia and Suburban Land Development Co. at *Fort Washington Heights, Pa*. . . . F. H. A. has approved construction of 48 apartments for veterans in East 52d Street, *Indianapolis, Ind.*

Water supply and sewers—Conduit and Foundation Corp. was low bidder at $2,058,000 for a sewerage system at the *Philadelphia, Pa.*, Naval Air Materials Center and Naval Base. . . . Carl M. Hoskinson, superintendent of the water department, told the city council of *Sacramento, Calif.*, that over $3,000,000 would be needed to improve the city's water facilities. . . . The county commissioners of *Cuyahoga County, Ohio*, at the suggestion of S. J. Pearse, county health commissioner, have ordered all cesspools cleaned at least once every three years. They object to the installation of steel septic tanks, which, according to county health authorities, have a life of only from 3 to 10 years. Concrete tanks are favored.

Employment drops

(*Continued from* p. 37)

dex has remained practically level at a value of slightly over 177, which compares with the base of 100 for the year 1926. For the second week of May, the index dropped about a half a percent below the figure for the previous week. This drop was due to a reduction in price of the building grades of southern pine lumber and paints.

At the time Commissioner Clague made his statement, the Office of the Housing Expediter had under study the advisability of major relaxation—if not complete removal—of federal controls on building work. Informed Washington sources are predicting that the $50,000,000 weekly ceiling on non-residential construction may be increased to $65,000,000. Recently the restriction on housing that limits the construction of 1-family homes to structures of 1,500 sq. ft. of floor space was revised so that homes with 2,000 sq. ft. floor space may be built under several broad conditions.

HOUSE EXTENDS TIME FOR FEDERAL ROAD AID

The House of Representatives last week passed the bill (H. R. 1874) extending the time during which funds provided in the Federal-Aid Highway Act of 1944 would be available to state highway departments.

The bill would amend the law so that the $500,000,000 of federal money provided for each of the first three postwar years would continue to be available for two years after each specific year. As the law is now written, the money can only be carried over for one year, if not immediately requisitioned by the states.

An early and favorable vote by the Senate on the bill is expected.

During the week the Public Roads Administration announced allocation of the money provided for the fiscal year 1948 under the act previously mentioned. A detailed breakdown of the allocations will be published in an early issue.

Pennsylvania permits insurance firm housing

Life insurance companies may now invest millions of dollars in housing projects in Pennsylvania under legislation recently signed into law by Governor Duff. The new laws permit such companies to invest up to ten percent of their assets in houses, apartments or other dwellings.

They also authorize two or more companies with approval of the Pennsylvania State Insurance Commissioner to join in the development of housing projects. A 1945 law limiting such construction to slum clearance is repealed. Commercial and industrial buildings can also be built by insurance companies for long term lease.

Signing of the bills brings to a close a long battle waged for and against them. Among those who fought strongly for the legislation was the "Philadelphia Inquirer". Opposition came principally from private home building groups, who tried to insert a series of restrictive amendments, but supporters routed the attempt of opponents of the measure to inject a last-minute amendment which would have made projects built under the law open to everyone regardless of "race, creed or color."

In 1945 opponents of the legislation were able to put into the act the amendment limiting insurance company construction projects to slum clearance. The result was that insurance companies would not invest at all in housing in Pennsylvania.

AGC boards see price rises near peak, urge contractors to give firm bids

Seattle meeting of governing and advisory boards of Associated General Contractors recommends steps for improving business and relations with investing public

Declaring that construction costs in general are reaching their peak and becoming stabilized, the governing and advisory boards of the Associated General Contractors of America last week adopted a series of recommendations for improving construction business relations with customers.

The 10-point policy statement was adopted by this representative group of the construction industry following considerable open discussion engendered by a questionnaire sent by President F. W. Parrott to all the directors a few weeks before the meeting. Directors in attendance had sounded out their constituency so the statement is considered a cross-section of the present-day thinking on costs by top construction men.

The action was the center of deliberations at the annual spring board meeting, held at Seattle, Wash., May 19-21.

"Although conditions in the industry vary widely," directors said in a formal statement, "as a general trend, construction costs are reaching their peak and becoming stabilized.

"During a period which cannot be foreseen accurately, construction costs may decline gradually until they reach what can be considered new normal levels. . . . When prices reach these new normal levels, they generally will be substantially above prewar levels.

"The public should not be led to believe that there will be quick or drastic reductions in construction costs. . . . Decreases in wage rates are not foreseeable without a depression. Reductions in costs will come through elimination of uncertainties in business conditions, increased productivity of workmen, increased efficiency by management, and development of more economical methods of construction. . . . These changes will be gradual."

The statement acknowledged the development of buyers' resistance in construction. It is felt that this is, in part, the result of resistance to the prices of other services and commodities which has discouraged investment for expanded business facilities.

Steps recommended to be taken by general contractors throughout the country include the following: (a) Firm prices should be quoted to the owner and obtained from subcontractors and materials men; (b) fair wages should be paid and workmen should be encouraged to produce a day's work for a day's pay by settling disputes without work stoppage, eliminating wasteful practices, and permitting adequate apprentice training; (c) All possible steps should be taken to improve efficiency of management; (d) Owners should be discouraged from demanding the completion of projects at speeds which require overtime work at premium rates of pay or procedures requiring extra costs.

Statement on public works

The board, in adopting the report of the heavy construction division presented by George H. Atkinson, president, Guy F. Atkinson Co., South San Francisco, Calif., adopted a policy on public works construction. It recommended that appropriations be made on a continuing basis to permit advance planning and orderly economical construction of highway, flood control, river and harbor, reclamation, soil conservation, rural electrification, and other similar public works. This was felt necessary because the deferment of federal public works until periods of unemployment leads to sporadic bursts of construction activity with a resultant increase in costs to the government. Orderly development, they said, will tend to minimize inflation and depression.

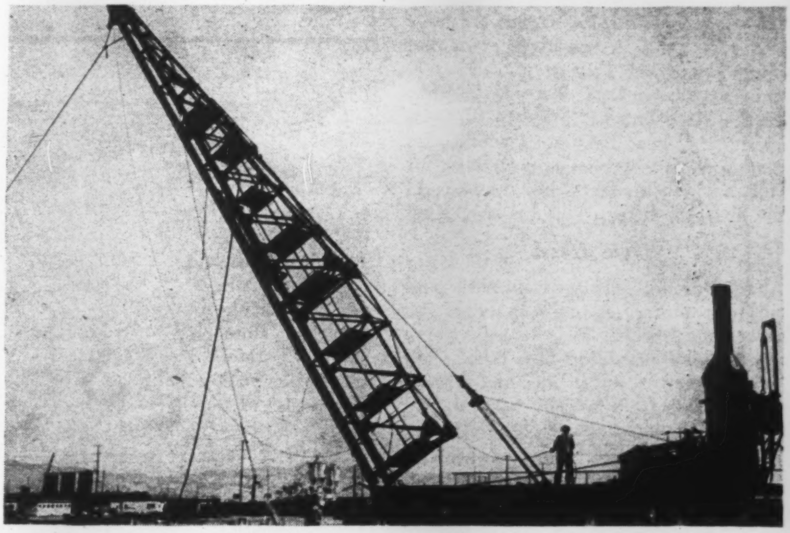
It was announced that a fall meeting of the board will be held in Des Moines, Iowa, on Sept. 28 to Oct. 1, and that the next annual convention will be held in Dallas, Tex., the second week in February.

◆

Senate passes the bill for science foundation

The Senate has passed a bill (S. 526) establishing a national foundation for fundamental research in science and engineering (*ENR* March 20, vol. p. 425). No funds are supplied in the measure, which is expected to be taken up at an early date by the House, but sponsors reported that they will request $20,000,000 to $25,000,000 to start the program.

As passed by the Senate, the bill creates a directing board to consist of 24 members who have had "outstanding records" in science, education and related fields. These members would be named by the President with approval of the Senate. Operation of the foundation would be centered in a 9-man executive committee every two years by the larger body of 24 members, and a full-time director receiving an annual salary of $15,000.



***Ready for Driving**—Workmen erect pile driver preparatory to recent start of construction on a $5,000,000 grease plant and package warehouse for the Standard Oil Co. of California, at Richmond, Calif. The Raymond Concrete Pile Co. holds a preliminary contract to drive some 6,000 piles to support the 335 ft. by 876-ft. structure planned. Barrett and Hilp, of San Francisco, are general contractors.*

Strike settlements feature labor news

Agreements mark end of some major building industry work stoppages—Other developments show continued uncertainty in labor picture

Settlement of a number of major labor disputes at scattered points in the United States brightened the nation-wide construction labor scene last week, although there were continuing reports of uncertainty and rising costs.

Among the settlements reported were:

A 12-week strike of plumbers and steamfitters at Akron, Ohio, ended when union representatives accepted a compromise offer of a 20-cent-per-hour increase in wages, and common laborers in the city ended a 1-day strike when they also were granted a 20-cent increase.

Six producers of cement in the New York-Pennsylvania area signed agreements with their workers to end a 4-week strike that had already started to affect construction in the east (*ENR* May 22, vol. p. 849) in a compromise that granted workers a 15-cent per hour increase, but rejected the unions' original demand for time-and-a-half for packers under certain conditions.

At Youngstown, Ohio, 600 union carpenters returned to work under agreements granting them a 12½ cent per hour increase; and union hodcarriers and common laborers ended an 11-day strike at South Bend, Ind., on an agreement to arbitrate points in dispute.

After receiving a 10 percent per hour pay raise and a one day-per month annual vacation with pay, some 600 maintenance workers returned to work for the West Virginia State Road Commission, although labor leaders said they hope to continue negotiations for overtime pay for snow and ice removal and for sick leave.

Wages frozen

Jacksonville, Fla., contractors and building trades unions concluded an agreement freezing all wages for three months, and providing that there shall be no strikes or picket lines and that all disputes be settled by arbitration during the period.

Workmen employed on construction of the Tucumcari, N. M., irrigation project returned to work after an 11-day strike, with a 20 to 25 cent per hour increase in wages granted by contractors.

Strikes and other evidence of labor uncertainty continued, however.

At Indianapolis, Ind., contractors warned 1,500 striking carpenters who walked off their jobs April 16 in a demand for a 32½ cent wage increase, that all large construction projects in the city may soon come to a complete halt unless the strike is settled. An estimated $15,000,000 in construction is involved.

In Canada, two building strikes were reported. At St. John, N. B., the United Brotherhood of Carpenters and Joiners demanded $1.10 per hour; and in Windsor, Ont., three construction jobs were being picketed as workers demanded higher pay. In Toronto, a city-wide building strike was threatened over demands of the Amalgamated Building Construction Workers Union (a C. I. O. group) for higher wages and better working conditions.

◆

Building apprentices set all-time record

The number of building trades apprentices employed during March continued to increase, again setting an all-time record, according to a report of the U. S. Department of Labor. The Apprentice-Training Service has listed 95,038 apprentices in those crafts throughout the country on April 1, representing an increase of 2,000 over the 93,035, the previous high reported at the end of February.

Unprecedented demand for tile in California, with a consequent need for more tile setters, is reflected in expansion of the tile apprentice training program, inaugurated in Los Angeles a year ago. The program has grown to a capacity enrollment of 32 of whom 90 percent are veterans.

N. Y. state to permit overtime on construction

In an attempt to attract additional skilled labor to urgently-needed state highway and water-supply projects, New York State officials announced last week that the state would grant "special dispensations" to contractors permitting employment of workers for more than 40 hours weekly.

Existing state law prohibits such employment, but enabling legislation enacted at the recent state legislative session permits the state's industrial commissioner to grant dispensations in the interest of expediting completion of public works contracts.

Explaining the procedure, Commissioner Edward Corsi said that on some projects—such as New York City's Delaware Aqueduct, and various state highway projects—where it can be demonstrated that urgency exists, his office may grant dispensations that will permit up to 60 hours weekly, with all work over 40 hours compensated for at time-and-a-half. Applications for such dispensations on contracts totalling about $40,000,000 have already been approved, while application on some $110,000,000 more await decision.

Mr. Corsi emphasized that there is to be no "blanket" permission for added pay, but that each application must be considered on its merits. He said that the state plans to make no adjustments to contractors whose jobs are already under way, even if overtime is granted. Increased and more economical use of machinery should compensate for any added expense, state officials believe.

***Erosion Solution**—New Hampshire highway engineers believe they have answered the problem of beach erosion near Hampton Beach, with this concrete-encased steel sheet-piling seawall, scheduled to be completed by mid-June. The 5-stage, $200,000 program was started in 1934. Cost of the wall is charged to the state highway fund. The structure replaces one destroyed in the hurricane of 1938.*

Plans are announced for U. N. headquarters

Central unit to be a 45-story skyscraper on the 17-acre site in New York City's East Side

Tentative plans for the future headquarters of the United Nations—a 45-story skyscraper center on a 17-acre tract on the east side of Manhattan, New York City (*ENR* Dec. 19, 1946, vol. p. 825) to cost upwards of $100,000,000—were made public on May 21.

Announcement of the plans was made by Wallace K. Harrison, chief planning officer, simultaneously with a disclosure that the city will spend $15,000,000 to improve the surrounding district along the East River with public parks, a highway with three-lined promenades leading into the international zone, and underground streets to carry through traffic past the site.

The plans call for a main structure which would be a 45-story Secretariat building, containing offices on the top floors for the Secretary General and his department. The lower part of the building would contain broadcasting studios, press offices and other special divisions, the office space providing room for personnel expansion to 5,000. There would be facilities for quick inter-floor circulation, including 20 escalators, movable partitions, pneumatic tubes and underground connections between all building units, including a subterranean garage for 2,000 cars.

The central unit will be the fan-shaped General Assembly hall. The three Council Chambers and four large committee rooms will be built in a low, flat unit along the river bank over the Franklin D. Roosevelt Drive.

Later another building may be built for employees' recreation. In the meantime, there will be a 600-seat theater in one of the units. There will be restaurants, a bank, a post office and other provisions for staff servicing. It will require two years to complete the first units.

For immediate use by some of the U. N. units the New York City Housing Authority building now being built at the south end of the site, will be bought by the United Nations for $1,500,000 on a rental-purchase basis, with the international organization probably moving in this summer.

Announcement of the plans was made to the Metropolitan Section of ASCE.

◆

CAA construction fund cut 50 percent by House

In passing the appropriation bill (H. R. 3311) for the Civil Aeronautics Administration for the next fiscal year the House last week cut that agency's request for airport construction money by 50 percent. It followed the recommendation of the House Appropriations Committee (*ENR*, May 15, vol. p. 797) in providing only $32,500,000 for building of class 4 and larger fields.

The committee said that this would be sufficient since the CAA still has available most of the $45,000,000 provided for construction during the present fiscal year, which ends June 30. With this carryover and the new money it is believed that a major start may be made on the $1 billion airport program approved by congress in May last year (*ENR*, May 16, vol. p. 763).

***Contractors on Wings**—Donald MacIsaac (center), head of the MacIsaac and Menke Co., Los Angeles contractors, decided recently that he was "too old to waste time" driving to far-flung jobs—(he's 52). So he obtained a pilot's license and the plane shown above, and now uses it to cover his work. Discussing details at Overton, Nev., are W. L. Pawson (left) piping superintendent, and D. H. Sanders (right) job superintendent.*

Group formed to push Middle Rio Grande work

Residents in New Mexico have organized the Middle Rio Grande Flood Control Association to obtain completion of apparently stalled surveys for that proposed project.

The organization resulted from the drastic cut proposed by the House of Representatives in the budget of the Reclamation Bureau, although leaders now believe both agencies have enough money to finish the report without added appropriations. The chief immediate aim is to cut through agency red tape to get the reports completed and coordinated, and to fight expected objections from the Elephant Butte Irrigation District (Rio Grande project of the Reclamation Bureau).

The proposed project, calling for expenditure of upwards of $40,000,000, would place flood control on the middle Rio Grande in the hands of the Army Engineers, and irrigation and power development with the Reclamation Bureau.

◆

Protest forest highway building fund cuts

Members of the Western Association of Highway Officials, representing 11 western states, joined recently in protesting curtailment of funds for forest highway construction and maintenance in western states.

Meeting in special session at Portland, Ore., members endorsed a resolution declaring that the $11,300,000 left in the national budget for work on these roads by the Department of the Interior is "a totally inadequate sum" for the continuance of the forest highway program.

"The federal government is now selling at high prices the timber in forest lands and is requesting the states to maintain new timber access roads under heavy logging traffic," the resolution says. "Many of these roads are so inadequate that the heavy loads rupture the surfacing, causing prohibitive maintenance costs to the end that many of the states have refused to take on this heavy obligation and are refusing to grant permits to operators of trucks to haul logs until the federal government builds these roads to adequate standards."

Al F. Winkler, chairman of the Montana State Highway Commission and president of the association, and Robert Allen, Nevada state highway engineer, were appointed to present the views of the organization to the congressional appropriations committees.

HIGHLIGHTS OF MUNICIPAL DEVELOPMENTS

New York discusses $270 million port rehabilitation scheme—Honolulu has $50 million construction program—Philadelphia buys airport land—Spokane to build sewage disposal works

Looking toward maintenance of its position as the leading U. S. seaport, the City of New York last week was considering a $270,000,000 plan for extensive rehabilitation and development of the city's waterfront facilities.

The program was presented to the Board of Estimate by the World Trade Corporation—a public benefit corporation created by the state legislature to undertake such work. It includes a $50,000,000 program for the reconstruction of Washington Market, a project long discussed but repeatedly delayed by war and cost considerations.

The World Trade Corporation is a body somewhat parallel to the Port of New York Authority, excepting that its activities concern only New York State's holdings in the port, and do not take account of neighboring New Jersey.

Proposed by the corporation are:

Placing of all city's dock and pier facilities, except certain municipal ferry and sanitation docks, under the control of the corporation or an authority to be created later; acquiring the principal private dock and dock warehouse properties within the city limits; reconstruction in a suitable and efficient form of the Washington Market; acquisition of a center for the further development and promotion of trade shows and exhibitions; establishment of a special center for foreign visitors and business people.

The corporation undertakes to guarantee annual payments at least equal to the $7,500,000 a year the city now nets from dock and pier rentals.

Advantages to the city, like the recent agreement to turn over operation of municipal airports to the Port of New York Authority, would include a lightening of the city's debt load.

Honolulu plans work

Anticipating an influx of tourist and business traffic, and an increase in population, the City of Honolulu, Hawaii, is now preparing plans to implement the territorial legislature's approval of bond issues totalling more than $50,000,000 for civic improvements. Final approval of a number of the bond issues hinges on the U. S. Congress, which keeps an annual ceiling on the bonded debt limits within the territory.

Among the projects authorized by the legislature were:

A $21,000,000 expenditure for new schools, hospitals, office buildings and other improvements; a $9,400,000 traffic tunnel from Honolulu to Windward Oahu, through the Koolau mountains; a $6,500,000 expansion of the city's sewer system; $2,300,000 for improvement to Honolulu parks; a $5,500,000 freight terminal and other improvements in Honolulu Harbor; and a $6,000,000 bond issue to match federal money and make $12,000,000 available for repair of tidal wave damage, widening and straightening Hamakua coast highway on the island of Hawaii.

Buys airport land

The city of Philadelphia and adjoining Tinicum Township, in Delaware County, Pa., reached an agreement last week whereby the city purchases 800 acres of township land for expansion of the Southwest Airport.

The agreement brought to a close a controversy that for a time threatened legal fireworks. The township was preparing to initiate legal steps seeking to have legislation passed to prevent a large municipality from coming into its area and annexing adjoining ground. Under the present agreement, the needed acreage will be condemned by Delaware County, and then sold to Philadelphia. The city will pay to Delaware County all district, school and county taxes—about $35,000 a year—that would ordinarily result from the acreage in question. These taxes will be paid in addition to some $16,000 already paid by the city to Delaware County for airport land already in use.

Spokane disposal plan

Bids for construction of first units of a $3,700,000 sewage disposal project at Spokane, Wash., will be called as soon as labor and materials are more readily available, with preparation of final working specifications nearing completion in the city engineer's office.

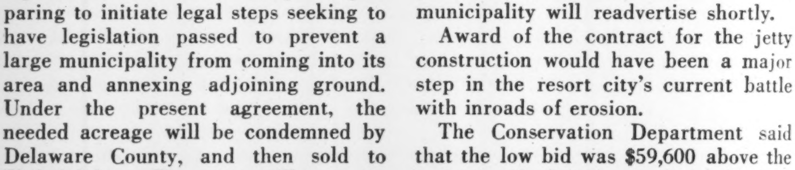
First bids will be taken on construction of 63,334 ft. of intercepting sewers and appurtenances feeding to the proposed sewage disposal plant. This project, to be divided into ten separate divisions for bidding, will involve three river crossings and 12,000 ft. of tunneling, half of which will be through solid basalt rock. Plans have been prepared by Greeley and Hansen, consulting engineers of Spokane.

Atlantic City jetties

A low bid of $752,056 received by Atlantic City, N. J., for the construction of eight stone jetties, has been termed excessive by the New Jersey State Department of Conservation and the municipality will readvertise shortly.

Award of the contract for the jetty construction would have been a major step in the resort city's current battle with inroads of erosion.

The Conservation Department said that the low bid was $59,600 above the estimate of what the work would cost.



***Open New Railroad Bridge**—Said to be the largest bridge to be built along the 6,000 miles of Baltimore and Ohio Railroad trackage during the past 25 years, a new $2,000,000 structure was opened for traffic recently at Point Pleasant, W. Va. Spanning the great Kanawha River near its junction with the Ohio River, the new structure is ½ miles long and replaces a 16-year-old structure (in the immediate background) which formerly served the railroad at the site. The main span is 480 ft. long.*

Three states announce plans for bridge work

Indiana, Nebraska, Maine to build structures—Maine bridge to be toll crossing over Kennebec River

The Indiana State Highway Commission will receive bids June 3 for the erection of the sub-structure for the new bridge to carry U. S. Route 36 across the Wabash River at Montezuma, Ind., replacing an older bridge which collapsed two years ago. J. N. Cooper, Indianapolis, is state engineer of bridges, and John H. Lauer is chairman of the commission.

The new bridge will be a steel-truss structure, with six 200-ft. spans, capable of carrying traffic over the highest flood waters known on the Wabash. It will have a 28-ft. roadway and two pedestrian walks. These separate bids will be called on the bridge, as follows: erection of piers and abutments; fabrication of steel and actual erection of steel structures and building of bridge floors; and grading and paving on bridge and approaches to connect with the highway.

Plan Missouri River span

The Burt County Bridge Commission at Decatur, Neb., is advertising for bids to be opened June 16 for a $750,000 bridge over the Missouri River at that place. It is proposed to build a highway bridge with two 420-ft. continuous through-truss main spans and long deck-truss and deck-girder approaches.

Bids are to include the approach embankment and paving, roadway lighting, and the toll house. Engineers are Kirkham Engineering Co.

Kennebec River bridge

Gov. Horace A. Hildreth of Maine on May 12 signed a bill directing the highway commission to use state and federal funds to build a toll bridge across the Kennebec River in Augusta, ending 13 years of discussion and planning on the project.

Officials cautioned that many steps have to be taken before actual working plans can be drawn, including the selection of a site, drawing up a work program, obtaining approval of the Federal Bureau of Public Roads and the War Department (the latter necessary since the bridge will span tide water).

The bill leaves selection of a site to the State Highway Commission, and it was believed action would be taken soon, in order to allow an early start on subsequent steps. Most favored of three locations is the Hartford Square to Cony Square location.

Lack of road designers handicaps Ohio work

Lack of highway design engineers is the greatest obstacle in the Ohio Highway Department's plan to improve the state's roads, according to Director Murry D. Shaffer. He reported that designers are leaving the state civil service rolls for better pay in private industry.

The present pay schedule for designers runs from $2,400 to $4,500, depending on previous experience. Shaffer said that most designers are trained in the state highway department after coming directly from college, but most of the present graduating class of civil engineers at Ohio State University plan to work for railroads or other industries.

◆

Grant year of grace for N. C. road billboards

The North Carolina Highway Commission has granted an extension until the end of 1948 of the time allowed for the removal of all outdoor billboards less than 50 ft. from the center line of state highways and which are considered hazardous to the right-of-way.

The commission first approved a resolution calling for the removal of the billboards in 1941, and in 1943 set a deadline of January, 1944, for the removal of the signs. This was extended in March 1945, to the duration of the war, plus six months, which period would have expired this July 1.

The new extension was granted on the request of representatives of the Outdoor Advertising Association of North Carolina, who told the commission that the billboard firms had been unable to get labor, materials and equipment needed to do the removal job. The commission was told that it would cost about $83,000 to complete the removal.

◆

May finance Cascade bore through a bond issue

Although the recent Washington state legislature failed to act on measures to finance construction of a high-level toll tunnel through the Cascade Mountains at Snoqualmie Pass, Gov. Mon C. Wallgren has not abandoned the $22,000,000 project.

The governor has said that banking interests have invited the Washington Toll Bridge Authority to call for bids on bonds to finance the 2½-mi. bore. If suitable bids could be obtained, the tunnel could be built without legislative appropriation or authorization, and without federal or other "outside" aid, the governor said.

The law establishing the authority authorizes it to act without further legislative enactment if it chooses, Wallgren added.

Discuss California road plan finance

Laws that will have the effect of charging the cost of any new San Francisco Bay crossing to its future users were designed last week by Governor Earl Warren of California. The measures also provided that the unpaid balance still owing on the existing bridge is to be lumped with the cost of any new structure, and the entire account paid off through revenue bonds.

To the cost of the new bridge—a cost that cannot be calculated until a decision is made on type and location (*ENR* Feb. 27, vol. p. 345)—will be added $6,288,550, the amount the state advanced in 1933 to finance construction of approaches to the present Bay bridge.

Meanwhile a 10-man senate-assembly committee attempted to piece together an acceptable compromise out of the much amended remains of Senate Bill 5, which was drawn to finance the state's planned $2,800,000,000 highway program (*ENR* March 13 vol. p. 411).

A senate-approved version followed for the most part the recommendations made by a special committee on the highway program (*ENR* Nov. 7, 1946, vol. p. 609) and incorporated tax features to raise some $86,000,000 of new revenue annually. The assembly, however, cut the bill to ribbons, claiming that more study of the plan was needed and arguing that current revenues were enough for a start on the program. The lower house finally wound up with a bill that would raise only about $5,000,000 a year in new revenue, and then the measure was turned over to the combined committee.

After a week's preliminary hearing, the compromise committee was apparently little nearer agreement on a bill acceptable to the governor as well as both houses last week. Legislative observers did not discount the possibility that the committee may reach a deadlock and that no action would be taken at this session.

Present state taxes affecting motorists are comparatively low. Vehicle registration fees are $3, and the state gasoline tax is 2 cents per gallon.

Engineering groups form N. Y. Technical Council

Incorporation of the Technical Societies Council of New York City was announced recently, including in its membership engineering and technical societies in the metropolitan area. Main objectives are the advancement of engineering, scientific or technical knowledge and the furthering of high professional standards.

Fourteen societies are charter members of the council, either directly or through their local sections. They are: American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Heating and Ventilating Engineers, The American Society of Mechanical Engineers, American Society for Metals, American Society of Safety Engineers, American Society for Testing Materials, American Society of Tool Engineers, American Chemical Society, American Welding Society, Illuminating Engineering Society, Institute of Radio Engineers, Society of Motion Picture Engineers.

The Metropolitan Section of the American Society of Civil Engineers also has been invited to join the council.

The following constitute the board of directors: H. C. R. Carlson, president, ASME; H. P. Wall, vice-president, ASSE; M. P. Davis, secretary, ASTM; H. F. Dart, treasurer, IRE.

Building safety council named in Georgia

A Building Safety Council, recently authorized by the Georgia legislature, (*ENR* May 15, vol. p. 796) has been named by the governor. Those appointed include Felton Davis, Valdosta, architect; Harry C. Robert, Jr., Atlanta, structural engineer; Hugh McMath, Columbus, mechanical engineer; Henry C. Beaty, Savannah, electrical engineer; E. M. Myers, Atlanta, general contractor; Roy A. Green, Columbia, representative of labor; and D. M. Harper, Atlanta, building inspector.

The new law requires that all existing and new structures, except dwellings and farm buildings, obtain state certificates of occupancy. For the first two years the principal requirement will be exit safety as prescribed by the Building Exit Code, American Standard ASA9.1-1946.

The law creating the Building Safety Council states that four of the seven members must be registered architects or professional engineers.

N. Y. apartment project to cost $30 million

Work has started on the first group of a 3,800-apartment development to be built on a 175-acre tract in the eastern end of the Borough of Queens, New York City.

One of the largest privately-financed projects in the east, the development will be known as Glen Oaks Village, and will represent an outlay of about $30,000,000, according to the Gross-Morton Co., builders. First units will be ready for occupancy in the early fall, the owners said.

Rentals for three-room apartments in the garden-type development will begin at $66 per month, and 5-room suites will rent for $96. Individual garages will be provided for tenants at a nominal charge, and free parking facilities will also be provided. Included in the "village" will be a 15 acre shopping center.

Architect for the project is Benjamin Braunstein, of New York City.

See new contract letting for Bull Shoals Dam

Col. Gerald Galloway, district engineer at Little Rock, Ark., is expecting to award a contract this month for construction of the main Bull Shoals Dam structure on the White River in north-central Arkansas.

The Ozark Dam Constructors of Houston, Tex., a 9-member construction firm, submitted the low bid of $22,146,440.

The dam is to be a gravity-type concrete structure 263 ft. high and with a crest length of 2,394 ft. It is expected that between three and three and one-half years will be required for its construction.

The Corps of Engineers had rejected previous bids after a 4-month period of controversy (*ENR* Jan. 2. vol. p. 14) and following a series of delays occasioned by President Truman's drive for economies in federal spending. A revision in specifications was responsible for the lower bid price this year.

W. Poppenheimer has been named resident engineer on the project. Members of the contracting firm include: Brown and Root Co., Houston, Tex.; Wunderlich Construction Co., Jefferson City, Mo.; Morrison-Knudsen, Boise, Idaho; Peter Kiewit Sons Co., Omaha, Neb.; J. C. Maguire Co., Los Angeles, Calif.; Condon Cunningham Co., Omaha, Neb.; A. G. Gordon, Denver, Colo.; Winston Bros. Construction Co., Minneapolis, Minn.; and Charles H. Thompkins Co., Washington, D. C.

Moisseiff award set up for papers on design

Establishment of a new annual award, to be made by the American Society of Civil Engineers in honor of the late Leon S. Moisseiff, New York consulting engineer, has been announced by the American Society of Civil Engineers.

The award, a bronze medal and an appropriate certificate, will be made for an important paper published in *Transactions* and dealing with the broad field of structural design, including applied mechanics. The award will also be open to non-members of the society.

Expect Colorado water for San Diego this year

San Diego's 72-mi. aqueduct to bring Colorado River water to the California city by a connection to the Los Angeles Metropolitan Water District system at San Jacinto, (*ENR* Mar. 6 vol. p. 362) was 83 percent complete as of April 30, officials of the San Diego County Water Authority have reported.

J. L. Burkholder, general manager and chief engineer of the authority, said that 51 mi. of the 60 mi. of pipe have been laid while the excavation of all tunnels is complete except for 500 ft. of the Lilac tunnel. Both the 2,500-ft. San Vicente and the 3,000-ft. Red Mountain tunnels have been lined with concrete, while the foundation and arch work in the 4,700-ft. Rainbow and the 5,850-ft. Fire Hill tunnels is nearly completed.

Maryland commission for water pollution control

A bill setting up a 7-man water pollution control commission has been signed into law in Maryland, to go into effect on June 1 next.

The seven members will consist of the Director of the State Department of Health, the Chairman of the Board of Natural Resources, the State Game Warden, the Director of the Department of Research and Education and three members appointed by the governor. The term of the commissioners will be for six years, with no salary.

Commission duties will be to study, and from time to time recommend methods of preventing pollution. The commission is authorized to encourage voluntary cooperation by inviduals, municipalities and other organizations in cleaning up the streams of Maryland and to enforce existing state laws relating to pollution abatement.

OBITUARY

Francis J. Steeno, city engineer of Green Bay, Wis., died May 17 at Rochester, Minn. He served more than 30 years in the engineering department of Green Bay, as city engineer from May 1, 1927. He had been in the employ of the department from October, 1916, continuously with the exception of about 1½ years service in the Armed Forces during World War I.

Theodore C. Schwartz, 59, civil engineer for Kansas City, Mo., and formerly with the Missouri Pacific Railroad, died May 20.

Robert R. Nace, 64, chief engineer of the Pennsylvania Railroad's New York zone and of the Long Island Rail Road since 1928, died in New York City May 19. He was educated at Drexel Institute, Philadelphia, Pa., and in 1901 started as a rodman for the Pennsylvania Railroad, becoming engineer of maintenance of way in 1920.

William D. Faucette, 66, executive representative of the Seaboard Air Line Railroad, died May 19 at Norfolk, Va. He was a graduate of North Carolina State College, and entered railroad service in 1901 as assistant engineer in the Savannah, Ga., office of the S. A. L. From Jan. 1, 1913 to 1944 he was chief engineer of the system.

Alfred F. Smith, 65, civil engineer, of Wakefield, Mass., died May 15. He had been engineer on major enterprises in all parts of the United States, especially on railroad and oil projects. He spent much time in Venezuela. Since 1939 he had been employed by the Stone & Webster Engineering Corp.

S. L. G. Knox, 76, former vice president and chief engineer of the Bucyrus Co., and father of N. R. Knox, president of Bucyrus-Erie Co., South Milwaukee, Wis., died May 7 at his home in Englewood, N. J.

Maj. John S. Beakey, 47, former Oregon state traffic engineer, died recently in Denver, Colo. As a highway engineering officer in the Corps of Engineers, he was wounded in Normandy shortly after D-Day, and had been hospitalized since then. Major Beakey was a graduate of the Oregon State College school of engineering, joining that state's highway department in 1924. He became state highway engineer in 1929.

Alfred Feustel, 93, construction superintendent for the Ohio Highway Department from 1911 until he retired in 1938, died in Columbus, May 13. He had supervised road building in 80 of the 88 counties in the state.

Bert Beucler, 61, died May 16 in Bryan, Ohio. He was a graduate of Ohio State University, and served as Williams County surveyor from 1915 to 1919. Later he served as division engineer of the Ohio Highway Department.

Vernon L. Dalby, 33, a captain in the Army Engineers during the war, and an engineer at Babcock & Wilcox Co., Barberton, Ohio, died May 11.

◆

Iowa allocates funds for county roads

The Iowa legislature has set up a new principle for the allocation of state moneys to county roads. An act, passed after an extended legislative battle, provides that the state highway commission shall allocate up to $4,000,000 a year to counties for such roads on a need basis if receipts into the primary road fund top $21,000,000 a year.

Heretofore all allocations to the secondary or county road system have been on a county area basis. The new act is expected to give southern Iowa counties about $1,000,000 more for their county roads this year.

The legislature also raised from $1,000 a mile to $3,000 a mile the maximum amount county boards of supervisors may spend on secondary road construction work.

MAJOR MEETINGS

American Society for Testing Materials, 50th annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-20.

American Society of Engineering Education, annual meeting, University of Minnesota, Minneapolis, Minn., June 17-21.

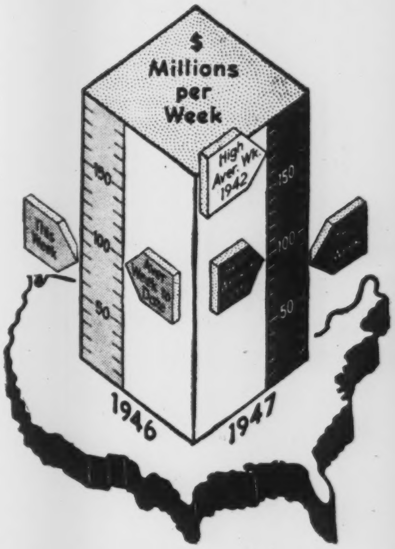
President's Highway Safety Conference, Action Program group, Auditorium, Department of the Interior, Washington, D. C., June 18-20.

Midwest Flood Control Conference, Hotel Severin, Indianapolis, Ind., June 18-20.

American Water Works Association, 67th annual conference, jointly with Federation of Sewage Works Association, 20th annual meeting, Civic Auditorium, San Francisco, Calif., July 21-25.

Federation of Sewage Works Associations, jointly with American Water Works Association. See above.

CONSTRUCTION ACTIVITY



As Reported this week to...
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

	Week of May 29 1947	Cumulative 1947 (22 wks.)	Cumulative 1946 (22 wks.)
Federal	$ 5,756	$226,117	$248,770
State & Mun.	27,433	640,047	498,397
Total Public	$33,189	$866,164	$747,167
Total Private	39,037	1,290,526	1,329,550
U. S. Total	**$72,226**	**$2,156,690**	**$2,076,717**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1947 (22 wks.)	Cumulative 1946 (22 wks.)
Waterworks ...	$1,569	$50,172	$41,306
Sewerage	959	44,371	26,818
Bridges	2,014	64,149	50,433
Highways	15,562	292,831	287,048
Earthwork, Waterways	1,417	104,820	150,694
Buildings, Public	7,103	210,204	123,703
Industrial	12,051	338,678	417,434
Commercial ..	25,642	758,065	831,202
Unclassified ...	5,909	293,400	148,079

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1947 (22 wks.)	Cumulative 1946 (22 wks.)
NON-FEDERAL		$436,159
Corporate Securities.	Current	187,317
State and Municipal.	figures	248,832
FEDERAL	not	158,320
	available	
Total Capital.................		**$594,479**

ENR INDEX NUMBERS

Index Base = 100	1913	1926
Construction Cost. May '47	396.49	190.59
Building Cost.... May '47	299.61	161.96
Volume .... Apr. '47	247	108

EDITORIALS

VOLUME 138 NUMBER 22

May 29, 1947

High Construction Costs

PURCHASERS OF CONSTRUCTION services are largely responsible for present high building costs. This is the conclusion reached by both labor leaders and contractors in a nation wide survey of conditions in the construction industry made by ENGINEERING NEWS-RECORD and published in this issue. Strong support is given to this conclusion by last week's decision of the New York State Industrial Commissioner to declare that an emergency exists with respect to public work in that state, thus making it legal for contractors on such projects to engage in overtime operations; overtime rates, of course, lead to higher costs. However, careful reading of our survey will show that many other factors have helped to push construction costs to unprecedented levels. Responsibility for many of them rest with labor, the contractors share in a few, as do also the suppliers of construction materials, and still others are an aftermath of the war. Finger pointing, however, will not bring costs down. They can be brought down only by cooperation and a willingness to put the general welfare above that of any individual or group.

Dispersal of Industry

BEHIND THE SCENES in Washington is a high-level planning study of major long-term significance to the construction industry. It relates to the problem of dispersal of industry to meet the threat of modern weapons of warfare, and it deals with expenditures of astronomical amounts of money. It also deals with such a complexity of problems that no ready solution is apparent, and yet the Army and Navy Munitions Board, highest mobilization planning agency in the country, is devoting a large part of its time to it. Industry, in general, is tending toward decentralization but from natural causes and not with any military strategic purpose in mind. It is also moving too slowly in that direction, so that it is both to accelerate and direct the movement that the study has been undertaken. Were a concerted program of dispersal to be undertaken, the consequences to construction would be many fold. Not only would factories have to be built, but major population shifts would occur that would require extensive municipal construction. In general, the job that was done at Oak Ridge, Tenn. for the atom-bomb project would have to be duplicated for most or all key industries. Another phase of the program is the locating of some of these factories underground. A contract for engineering studies of this possibility has recently been let, as noted in the news pages of this issue. Such projects for remaking the country sound fantastic. But because they could be fantastic and yet be undertaken is sufficient reason that the construction industry should be giving thought to the problems involved.

What's Ahead in Sewage Treatment?

SOME IDEA of what the "postwar" sewage treatment plant will include may be gleaned from the story in this issue (p. 48) on the design features of the Los Angeles installation. One of the first and largest of the new plants to be put under construction since the war's end, its design may be considered as representative of present trends and thinking. For example, one of the basic assumptions relating to the anticipated suspended solids content of the raw sewage includes an allowance for future installation of home garbage disposal units; this reveals that the consultants on the project no longer consider the matter of garbage disposal through the sewer system as simply an academic question. Another design provision takes into account the desirability of choice in either digesting sludge for its gas byproduct or conversion of sludge into fertilizer. Furthermore, the sludge gas engines for power will be of the dual-fuel type, which operate on either gas or oil with a flick of the switch and thus add further flexibility to plant operation. These and other design considerations at Los Angeles, such as the use of modified aeration and sludge elutriation, provide some basis for evaluating what's ahead in municipal sewage treatment plant practice.

Garbage Grinder Estimates

ONE of the most elusive assumptions with which designers of new sewage treatment works must deal concerns the probable additional load imposed by the use of home garbage grinding units. Data are not lacking on the amount and character of such wastes on a per capita basis. But these cannot be translated into terms of over-all effect on the community's sewage flow until some estimates are available to indicate the number of such grinders that may be installed. These estimates, in turn, are dependent on the economic status of the people in the community in relation to the cost of grinding units. It has been generally conceded that a garbage grinder is a luxury item, or at least so high in cost at the present time that it is beyond the reach of the majority of home owners. Yet, in an analysis made by a household appliance manufacturer several months ago, it was shown that 30.3 percent of the orders for metal cabinet sinks included those with grinder units attached; before the war it was estimated that there were only 50,000 units in use, distributed over 300 communities. This is something for sanitary engineers to think about when designing municipal sewage treatment works.

Engineering for Foreign Governments

Last year a considerable part of the civil engineering profession in this country went on record as opposed to legislation sponsored by the State Department that appeared to authorize federal departments to give foreign governments an almost unlimited amount of aid in doing engineering work either through the loan of experts or through work done in the offices of such departments in this country. Partly as a result of that protest, the legislation was not approved by Congress. Now, similar legislation is before Congress (*ENR* May 15, vol. p. 793). But this legislation carries the endorsement of the American Society of Civil Engineers as a result of modification of its controversial provisions after conferences between representatives of that society and the State Department. The significance of this, it would appear, is not in changes that were made in revising the earlier bill—important as they may be—but in the fact that the new bill provides for a panel of engineers to advise the State Department on questions relating to engineering assistance given to foreign governments by our federal agencies. The ASCE representatives not only convinced the State Department on the need for modification of the original bill but also brought to the department a new consciousness of the importance of engineers *as a group* to the proper functioning of this country's relations with other nations. This is a notable accomplishment.

St. Lawrence Plans Revived

Joint resolutions designed to permit an early start on development of the international section of the St. Lawrence River for power and navigation have been introduced into both houses of Congress. Aside from the fact that these resolutions are designed to give new life to the unratified and now outdated agreement of 1941, they have much to commend them. There is no doubt as to the imminent need for the power that can be developed in the International Rapids section of the river, and if dams are to be built in the river for power purposes, modernization of the waterway at the same time would appear to be logical.

But neither the power nor the navigation facilities are so badly needed as to make it necessary to seek their authorization through approval of a patched up edition of the 1941 agreement. That agreement's chief defect was in its failure to protect the rights of the United States with respect to the use of water at Niagara for power. And while it is true that the joint resolution now before Congress eliminates the article in the 1941 agreement relating to diversions from the Niagara River, the end result is to leave in the amended agreement the only clause relating to diversions that is of importance to Canadians to protect their rights to water now being diverted by them into the Great Lakes system.

Any agreement to be signed at this time should contain no provisions relating to diversions of water into or out of the Great Lakes system—leaving that subject for separate negotiations—or it should cover the subject completely, covering our needs for modernization of the old 1909 boundary waters treaty as well as Canada's. If the deletions now proposed are made in the 1941 agreement, we will have no bargaining point left.

Senator Vandenberg, one of the sponsors of the joint resolution and chairman of the Senate Foreign Relations Committee, is said to have stated that his committee is so preoccupied with more important international issues as to make action on the St. Lawrence agreement improbable this year. If that is the case, there would appear to be ample time for the drafting of a new agreement that will fully recognize developments since the 1941 agreement was written.

ENGINEERING NEWS-RECORD
WALDO G. BOWMAN, *Editor*, EDWARD J. CLEARY, *Executive Editor*
New York: V. T. BOUGHTON, R. K. TOMLIN, H. W. HUNT, E. E. HALMOS, JR., T. D. MacGREGOR, JOHN C. BUMSTEAD and F. S. MERRITT
Chicago: V. B. SMITH, *Cleveland:* J. R. CARR, *Washington:* A. N. CARTER, *San Francisco:* N. A. BOWERS, L. L. WISE
EDITORIAL OFFICES: 330 WEST FORTY-SECOND STREET, NEW YORK, N. Y.

Copyright, 1947, by McGraw-Hill Publishing Company, Inc.

Construction Under Way on the...

Biggest Sewage Works in the West

Contents in Brief—*With some $9,000,000 of contracts under way, the Los Angeles sewage disposal program, estimated to cost more than $25,000,000, centers around a 245-mgd., high-rate activated sludge treatment plant. Completion of the program is expected to bring to an end long years of litigation and beach contamination. An outline of the various phases of the program and their present status are presented as well as a description of the design.*

Now in its initial construction stage in Los Angeles is the long-discussed sewage disposal program that is intended to put an end to beach contamination and the resultant quarantine of more than ten miles of southern California beaches. Included in this program is a 245 mgd. high-rate activated sludge plant that will be the largest treatment plant in the West.

To prepare the site for the plant, which is near the beach at Hyperion, a contract has been let for moving 14,100,000 cu.yd. of sand. A second contract has been let for a mile-long reinforced concrete outfall to carry the treated effluent to deep water. While the plant is under construction, the city plans to chlorinate the entire flow of sewage during the summer season, making use of a temporary chlorinating installation just completed. By so doing, it is hoped that the beach quarantine in part can be lifted.

This article on design of the Los Angeles sewage treatment plant is the first of several to be published in *Engineering News-Record* covering various phases of work being done by the city at Hyperion, Calif., in connection with the treatment facilities. Other articles will appear as construction operations include interesting stages.

Beaches quarantined since 1943

In 1943 as the result of a year-long program of sampling and study, the California State Department of Public Health quarantined some ten miles of beaches contaminated by sewage from the Los Angeles Hyperion outfall. These beaches included some of the most popular in the southern California area where year-around surf bathing is enjoyed.

In large measure the quarantine was the result of tests made on samples of surf water that showed an excess of coliform bacteria. However, in the central area, a mile or two on each side of the outfall, the quarantine was also based on visible indications of sewage on the beach. Grease, feces, matches, and soap were evident. Grease, in some cases, lay on the beach in thick waves.

Chlorination of the entire flow of sewage starting this year, it is hoped, will relieve from quarantine the area subject to bacterial contamination. When the new plant is finished and in operation, the entire area, including that quarantined because of visible indications of sewage on the beaches, may be relieved of the quarantine.

The sewage treatment program is estimated to cost more than $25,000,000. It is being financed by the proceeds from a $10,000,000 city bond issue, a matching grant from the state, and payments by cities and districts discharging sewage into the system.

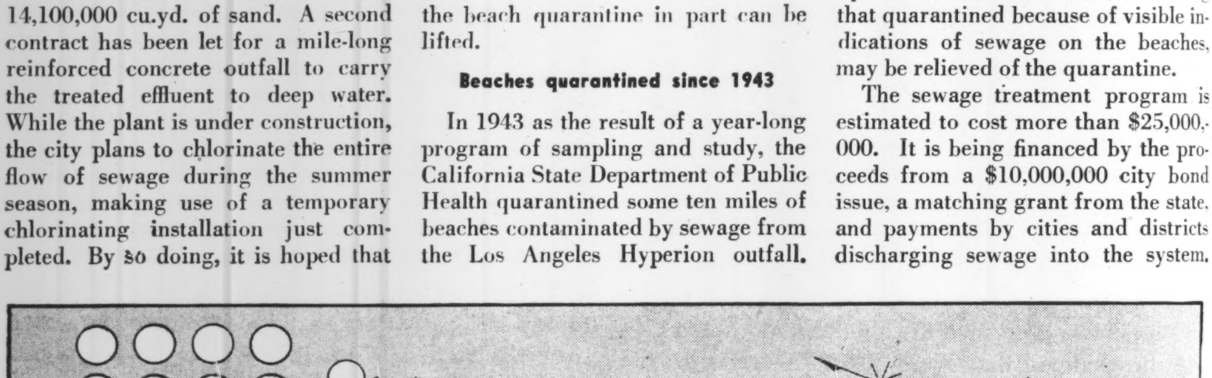


Fig. 1. The plant is designed to permit simple control and flexibility of operation. It is located on Vista Del Mar Ave.

TENTATIVE DESIGN AND ENGINEERING DATA FOR THE HYPERION ACTIVATED SLUDGE PLANT

Treatment: Stone removal by baskets; coarse screening; comminution; grit removal; primary sedimentation; high-rate activated sludge treatment (aeration and sludge recirculation); secondary sedimentation; pre- and post-chlorination when required; primary and secondary sludge digestion; elutriation; vacuum filtration; sludge drying; and gas recovery for heat and power purposes.

Plant Capacity: 245 mgd. aver.; 350 mgd. dry weather peak; 420 mgd. wet (storm) weather peak.

Sewage Characteristics: Domestic and industrial wastes from estimated tributary population of 3,000,000 with per capita daily aver. of 0.23 lb. suspended solids (equivalent to 340 ppm. to accommodate future installation of home garbage disposal units) and 5-day B.O.D. of 250 ppm.

Bar Screens: Four units to fit channel 10.5x12 ft. with clear openings between bars 1.0 in. and bar thickness of ⅜ in. Sewage depth to be 8.4 ft. Velocity with four screens operating 2.1 fps., three operating 2.8 fps.

Comminutors: Two 36-in. units specified as equivalent to Chicago Pump Co. type 36-A, each unit to be capable of grinding 750 lb. per hr. With max. flow of 420 mgd. max. flow to comminutors will be 50 mgd. and the head loss of 1.25 ft.

Grit Removal Tanks: Three units, each 60x60x5 ft. with a detention period of 2.3 min., surface loading of 23,540 gal. per sq.ft. per day and flow through velocity of 0.42 fps.

Pre-aeration Channels: Two units, each 320x15x15 ft., detention period of 6 min. each and a max. air requirement of 0.018 cu.ft. per gal.

Primary Settling Tanks: Eight units, each 300x76x15 ft. with a detention period of 2.0 hr. for 245 mgd. and 1.17 hr. for 420 mgd. Total weir length is 6,580 ft.

Aerators: Forty-four units, each 300x30x15 ft. with a detention period of 4.31 hr. and max. air requirement of 0.73 cu.ft. per gal.

Aerated Channels: Channels in aeration and final settling system carry mixed liquor having a capacity of 5,276,000 gal., a detention period of 0.52 hr. and a max. air requirement of 0.07 cu.ft. per gal.

Return Sludge Re-aeration: Channels for return sludge provided with aeration and having a capacity of 3,197,000 gal. and a detention period of 1.57 hr. for 20% of the sludge returned.

Final Settling Tanks: Twenty-four units, 125x76x15 ft. with a detention period of 2.5 hr. and total weir length of 22,360 ft.

Primary Sludge Digesters: Sixteen tanks, each 110 ft. dia. with a 32-ft. wall height to contain liquid to a depth of 30 ft. maintained at 100 deg. F. Detention period on the basis of both primary and secondary settlement is 19.2 days and for primary settlement only is 47.3 days.

Secondary Sludge Digesters: Eight units, dimensions as for primary digesters but with a detention period of 12 days for complete treatment and 30 days for primary settlement only.

Elutriation Tanks: Two units, 200x40x15 ft. Mixing period 1 min. for max. wash water to sludge ratio of 4 to 1 (avg.—3 to 1). Detention period 2.12 hr. for complete treatment and 5.48 hr. for primary sedimentation only.

Sludge Filters: Sixteen units with a total surface area of 9,120 sq.ft. each.

Sludge Driers: Four units, each capable of removing 22,500 lb. of water per hr. from the sludge.

Gas Containers: Three units, design incomplete.

Dual Fuel Engines: Eight units, each of 1,650 hp. to operate on either diesel fuel or gas from sludge digestion or a combination of the two. Vapor phase cooling used.

Centrifugal Blowers: Four units, each driven by a dual fuel engine and with a capacity of 40,000 cu.ft. per min.

Generators: Four units, each driven by a dual fuel engine and of 1,150-kva. capacity.

Cost: Estimated at more than $25,000,000 for outfall, site preparation and plant.

Facilities at Hyperion that have been in operation since 1925 include a screening plant and a mile-long, 7-ft. diameter, submarine outfall. From the start the outfall has been unsatisfactory because of many leaks and breaks through which sewage is discharged along the line rather than at its terminus. During the first ten years of the outfall's use, some $300,000 was spent in making repairs. Such efforts, in recent years, have been abandoned. The screening plant, although performing the job for which it was designed, removes a relatively small percentage of the suspended solids and none of the bacterial contamination.

A contract for the construction of a 5,000-ft., 12-ft. diameter reinforced concrete submarine outfall was awarded last year to the Guy F. Atkinson Construction Co. for $3,517,410. This outfall will discharge in water some 50 ft. deep.

A board of engineers consisting of Charles T. Leeds, A. M. Rawn, and Franklin Thomas was retained by the city to review the plans and specifications of the outfall. Although their study began before the contract was let, the city, according to the report of the board, under the pressure of necessity and in recognition of a court order, accepted the Atkinson bid for construction of the outfall before a report was submitted.

This board of engineers endorsed the plans prepared by the city as providing a safe and stable outfall, but recommended that the outfall be extended to a total length of 10,000 ft. by the addition of two 72-in., flexible joint, reinforced concrete pipes.

They further recommended that the treatment plant be constructed in two stages. The first stage is to consist of primary sedimentation and sludge di-

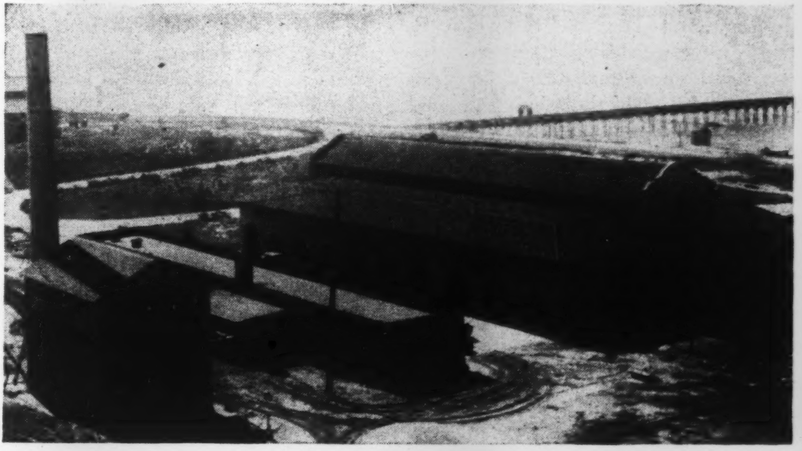


Fig. 2. This old screening plant, in operation since 1925, will be dismantled after it is replaced by new facilities now under construction.

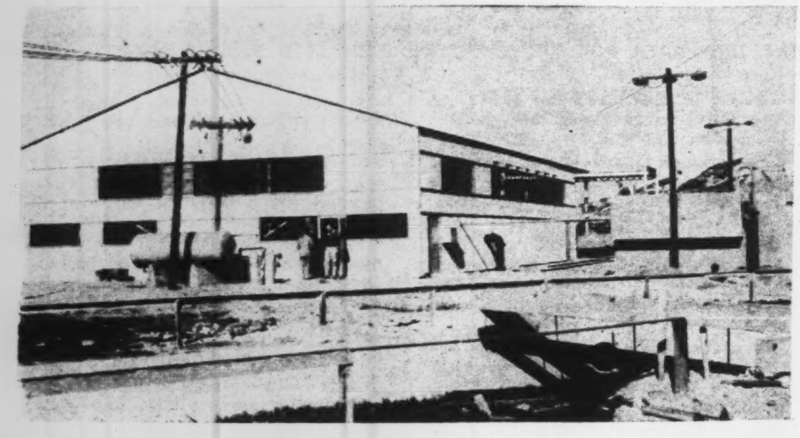


Fig. 3. This temporary chlorination plant will treat the entire flow of sewage so that some of the beach quarantine may be lifted.

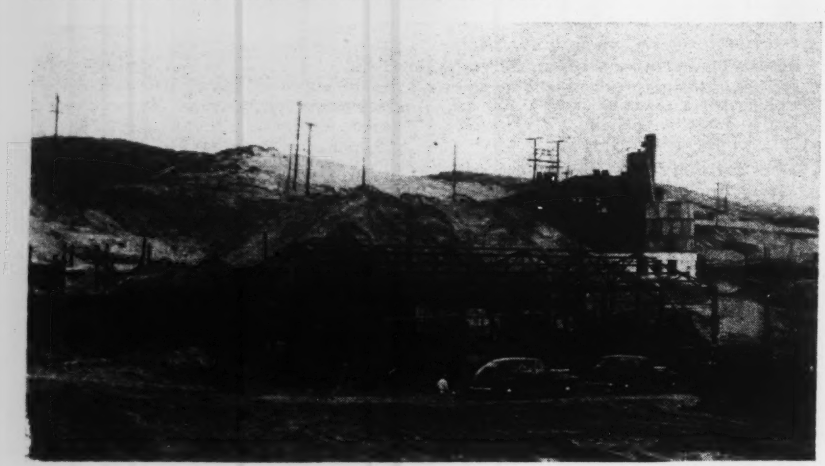


Fig. 4. Most of these sand dunes will be removed to prepare the site for the new treatment plant. The pump installation in foreground will be used to pump sand away.

gestion; and, when this stage is completed, the board recommended making studies to see if this plant plus the 10,000-ft. outfall eliminates contamination of beaches. If so, according to the board of engineers, the activated sludge treatment facilities need not be built, thus saving the city in excess of $10,000,000 on construction and more than $400,000 a year in operation cost. Final action has not been taken on these recommendations.

A second major contract for preliminary work at Hyperion was awarded to Peter Kiewit Sons' Co. for $3,497,000 for moving 14,100,000 cu.yd. of sand from the site of the plant. The contract allows two years for completion and the excavation will be so scheduled as to permit the construction of certain parts of the treatment works before the contract is completed. This will permit the primary treatment facilities to be built and placed in operation in advance of work on the secondary treatment facilities.

Most of the sand will be moved along the beaches north of the plant. There it will contribute to beach development for recreational purposes that the city is sponsoring.

Engineers report on L.A. system

On several occasions, outside engineers have been called on to review the Los Angeles system of sewers and method of treatment. In addition to the report on the outfall outlined in the foregoing, the two most recent reports were submitted in 1939 and 1944. The 1939 report by Samuel A. Greeley, Charles G. Hyde, and Franklin Thomas recommended the construction of three treatment plants some distance from the outfall in addition to extensive facilities at Hyperion by the ocean shore (*ENR* Feb. 29, 1940, vol. p. 315).

However, design of the plant now being built is based on a report submitted in 1944 by the firm of Metcalf & Eddy. The high-rate activated sludge plant which they recommended for Los Angeles is believed to be one of the largest of this type yet built. Except for sludge digesters and aerators, all plant units will be covered, making a total enclosed area of some 900,000 sq.ft., one of the largest enclosed sewage plants in the world.

Under normal operating conditions for complete treatment, sewage will pass through the following units: Stone baskets, bar racks, grit removal, two hours of primary settling, 4.31 hr. aeration, 2.5 hr. final settling and pre- and post-chlorination. Sludge will be treated in multiple digestion tanks, elutriated, filtered and dried for sale as fertilizer.

Basis of design

The plant is designed for an average flow of 245 mgd. from an estimated tributary population of 3,000,000. Capacity is available for a dry weather peak of 350 mgd. and a wet weather or storm peak of 420 mgd. Sewage characteristics for use in design include a five-day BOD of 250 ppm. and suspended solids of 340 ppm. or 0.23 lb. per capita per day. The figure for suspended solids includes allowance for future installation of home garbage disposal units.

Size of various elements of the plant and their relation are shown in the accompanying tabulation and plant layout. The headworks building, which is to include such items of equipment as bar screens, comminutors, grit chambers, etc., is now in construction under a $1,232,616 contract let to the James I. Barnes Construction Co.

To protect bar screen equipment from damage by bricks, stone or metallic objects moving along the bottom of the influent channels, a stone basket will be installed in front of each screen. Each basket consists of an 11-in. wide plate welded to the back of an inverted 5-in. steel channel and set in a recessed section of the invert so the plate is level with the invert. Welded to the channel so they slope downstream are fingers of heavy steel pipe some 2 in. in diameter and 15 in. long set on 4-in. centers. This device is intended to stop the heavy material and permit rags to slide over. Vertical guides are provided so the entire basket may be lifted out for cleaning.

Sludge handling is flexible

Handling of sludge illustrates the flexibility of plant operation. At appropriate locations ahead of sludge reaeration, pumps are connected into the channel. They can pump excess activated sludge either to the channel feeding the primary settling tanks or to a concentrating tank where it will be thickened preparatory to combining it with digested sludge before it is filtered. Thus, plant operators have a choice of using the excess activated sludge for gas production or mixing it with digested sludge to increase the nitrogen content of dry, solid sludge sold as fertilizer. The method used will depend upon the prevailing market price of the nitrogen in the fertilizer as balanced against the cost of gas and oil.

After sludge is digested, it will be elutriated, then filtered and dried. The elutriation process involves the addition of water to sludge for washing purposes to reduce alkaline content so that lesser amounts of ferric chloride will be required for coagulation of sludge prior to filtration.

The new Los Angeles plant will follow the method developed at Peoria, Ill., for the handling of supernatant liquor from the sludge digestors. This liquor will be combined with a certain amount of elutriate and returned sludge in the first aeration tank of each battery. The flow in this tank will be reversed and the mixture discharged into the aerator influent channel. This L. A. engineers hope, will take care of the usually vexing supernatant liquor problem.

Eight 1,650-hp. engines of the dual-fuel type will be installed at the plant. Although gas production at the plant is expected to be more than enough to operate the engines, the dual-fuel engines (which operate on either gas or oil with the flick of a switch, are being installed to provide for initial operation and for emergencies. Besides this, the manufacturers claim that with addition of some 8 percent of oil to the gas, engine efficiency will exceed that of an engine operated solely by gas by some 20 percent.

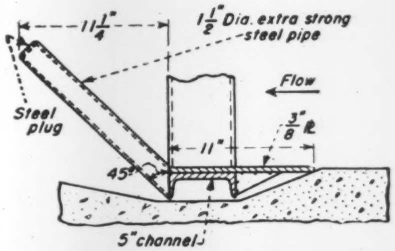


Fig. 5. Stone baskets, shown here in cross-section, will protect the bar screens from damage by heavy objects moving along channel bottoms.

The vapor-phase method of engine cooling (see *Diesel and Gas Engine Power Plants;* Boyer, McGraw-Hill Book Co. 1943, p. 215) has been specified by city engineers to provide more efficient engine operation and simpler control. The live steam furnished by this cooling method, together with steam from exhaust heat exchangers, will be used to heat primary digesters.

Half of the engines will be connected to generators for production of all electrical supply required. The other half will be connected to blowers through step-up gears. Maximum air supply will be 164,000 cu.ft. per min. at 7.75 psi.

Design of the plant is under the direction of H. G. Smith, engineer of sewer design, whose principal assistants are F. M. Darnell for administration and G. A. Parkes, W. A. Wright, and N. M. Cireno for general plant, structural and architectural design, respectively. Lloyd Aldrich is Los Angeles city engineer and Merrill Butler is deputy engineer for design.

Parking Authorities Proposed

At least eleven state legislatures are considering bills designed to expand or regulate public auto parking facilities in cities according to the American Municipal Association.

Pittsburgh, New Orleans, Indianapolis and other cities, meanwhile, are considering creation of parking authorities or other major means to alleviate steadily worsening traffic jams caused by lack of offstreet parking facilities.

The California legislature is considering a bill providing for formation of parking districts or authorities in unincorporated areas as well as municipalities. Proposed Maryland legislation would authorize Baltimore to borrow $5 million to buy and improve land for "parking, storage, and servicing of automobiles."

In Ohio, proposed legislation would authorize cities to provide public off-street parking facilities, to buy land, construct buildings, and to finance such projects by bond issuance, general revenues, or special assessments. Similar legislation in Oregon would authorize municipalities to condemn property for off-street parking facilities.

Maximum rates and bonding of operators would be regulated by bills introduced in Massachusetts, Pennsylvania, and Rhode Island. Bills authorizing cities to install and operate parking meters have been introduced in Arkansas, Illinois, Massachusetts, North Carolina, and Rhode Island. A city ordinance authorizing parking meters is being considered in Baltimore.

Pittsburgh councilmen, meanwhile are considering creation of a municipal authority to control all parking facilities in the downtown district. The authority would be composed of five citizens serving without pay and would issue $36 million in revenue bonds.

Under the plan, prepared by the Pittsburgh Regional Planning Association, the city would buy or lease, then operate, present parking garages and lots in the business district. Twenty additional garages and one parking lot would be built by the city. Space for a total of 25,818 autos would be provided, almost doubling the present downtown parking capacity.

A similar plan has been proposed to relieve traffic congestion in New Orleans. In Indianapolis, a mayor's committee has been appointed to plan locations, financing and building of municipal garages on the outskirts of the business district. Plans call for construction of four 1,000 car garages at a cost of $1.5 million each.

Roof Trusses with Welded Joints Tested By Jacking Against Each Other

ALL-WELDED TRUSSES of 40- to 50-ft. spans support the roofs of General Electric Co.'s great electronic-device research and manufacturing center, now in partial operation at Electronics Park near Syracuse, N. Y. Some of these trusses were tested, prior to installation, to study the performance of the welded design and as a result, the go-ahead signal for their use in the project was given.

Laid out and landscaped like a college campus, G. E.'s Electronics Park has a transmitter division building, a receiver plant and a miscellaneous specialties unit for manufacture. In addition, there are administration, laboratory, services and restaurant buildings and the usual boiler house.

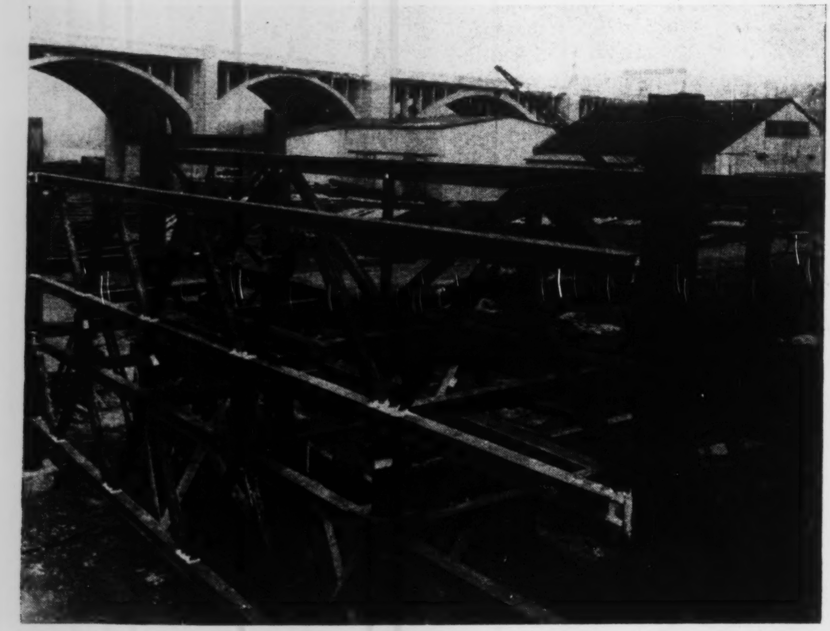
Each of the three main units—transmitter, receiver and specialties—is a separate entity. A two-story laboratory and office section, providing adequate space for experimental and administrative operation of each unit, faces the "central campus" and is backed by the one-story factory buildings for line production of parts and assembly of units.

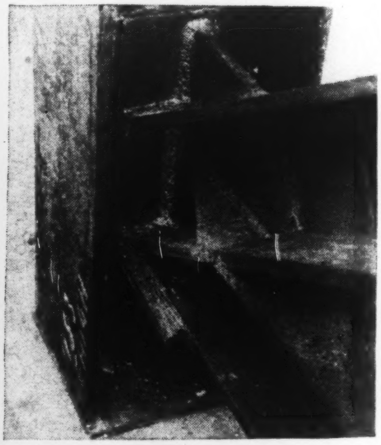
Controlled-conditions installations

Closely controlled conditions of temperature and humidity will be necessary in the laboratory and manufacturing areas. Installations for completely air conditioning the structures include fan houses located on the roof so that each unit can serve twelve to fifteen factory bays; an air outlet diffuser centrally located in each bay, discharging downward; and air conditioning ducts fitted into the roof-truss framing. Artificial lighting is used throughout the factory section, consisting of a fluorescent system designed to give 50 candlepower intensity at the work level.

Truss framing was arranged with the underside of the bottom chords flush, facilitating conveyor installation, and top chords arranged to support the concrete roof tile. The entire 15-ft. height below the bottom chords is reserved for processs equipment and space is provided within the depth of the trusses for installation of the four necessary services: sprinkler system, duct work, fluorescent lighting and process piping.

Typical steel roof trusses with welded joints, designed by Giffels and Vallet, Inc., and L. Rossetti, Associated Architects and Engineers, of Detroit, Mich., were tested in pairs by a novel arrangement prior to installation in the transmitter division building. Spanning 40 and 50 ft., the trusses are Warren-type with top and





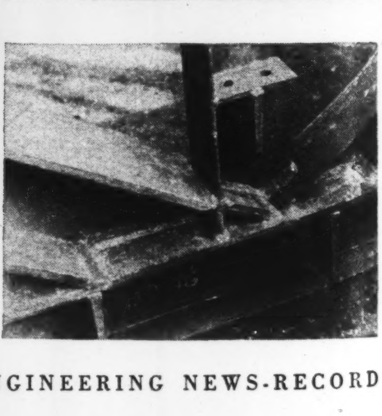


Fig. 1. Three pairs of roof trusses with welded joints were tested by means of jacks placed between them at panel points. Joints were whitewashed so that if cracks developed in the welds, they would be easily spotted. The trusses in the foreground are type T1, spanning 40 ft., and the adjacent set is T65, spanning 50 ft. The photos at the right show (top) the connection between a column and the bottom chord of T20 and (below) the third-point bottom-chord joint of T65.

bottom chords composed of wide-flange beams with webs vertical, all connections being made without the use of gusset plates.

The trusses tested included a pair designated T1, of 40-ft. span, a set T20 of about 50-ft. length, and two T65's, also 50 ft. long but designed for smaller loads. Placed in a vertical plane, one above the other, the pairs were supported at their ends on steel H-columns and the compression chords braced by horizontal struts. The trusses were loaded to one and one-half times the design load by means of hand-pumped hydraulic jacks with a ram diameter of 6½ in. Jacks were placed between the upper-panel points of the lower truss and the lower panel points of the other truss, which was installed inverted so that it would be stressed as when set in the building (Fig. 1).

Midspan deflections were measured and the welds inspected for defects. To more easily observe the behavior of the welds, the joints prior to testing were given a coat of whitewash, which would have shown up any cracks that might have developed.

Design checked by tests

The trusses performed satisfactorily under the test loads. None of them developed visible cracks or strain lines at any time, and measured deflections closely checked with computed ones. Inspection revealed that the load-carrying capacity of the trusses was not impaired, and they were used in the actual construction of the transmitter division building. With the design thus approved, general production welding of the remainder of the trusses required for this structure was initiated.

The tests, joint designs and the welding procedure and sequence were made by Lehigh Structural Steel Co. of Allentown, Pa., who held the contract for fabrication and erection. All welders were qualified in accordance with the "Operator Qualifications" of the American Welding Society, and machine welding was used on joints that lent themselves to this method.

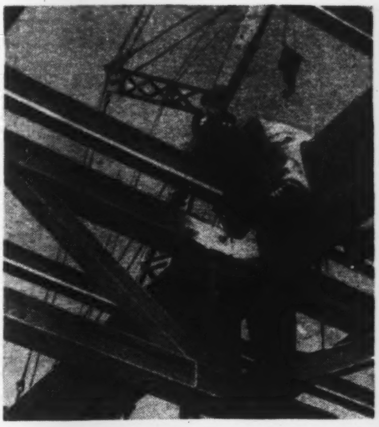


Fig. 2. A beam being welded to one of the trusses is carried on a T-shaped seat on a vertical of two angles machine butt-welded to form a Z-shape.

Trusses T1 had 6-in. WF 15.5-lb. upper and lower chords, about 40 ft. long, and two 4-in. WF 10-lb. diagonal web members in each of the 8-ft. panels. Since the top chord sloped, the depth out-to-out of chords varied from 5 ft. at one end to 5 ft. 10 in. at the other. Jack loads were applied at each of the panel points in increments of about 3,000 lb., up to 16,200 lb., at which time the midspan deflection was about 9/16 in. After the load was removed, the residual deflection or set was negligible.

With two diagonals in each 8-ft. 4-in. panel and depth out-to-out of chords of 6 ft. 8 in., trusses T20 had a 10-in. WF 112-lb. by 49-ft. long top chord with one 8⅛ x ⅜-in. shear plate welded on each side of the web for the full length. The 8-in. WF 67-lb. by 49-ft. long lower chord had two 6⅝ x ½-in. shear plates welded to the web for about 9 ft. on either side of the center of the span. The end diagonal member was an 8-in. WF 58-lb. beam, the next three diagonals 8-in. WF 48 lb. and the center four diagonals 5-in. WF 13.5 lb. Applied at the third points in increments of 55,000 lb. per pair of jacks, the load was brought up to 275,000 lb. and a deflection of 1¼ in. measured. In this case, also, after removal of the load, the set was negligible.

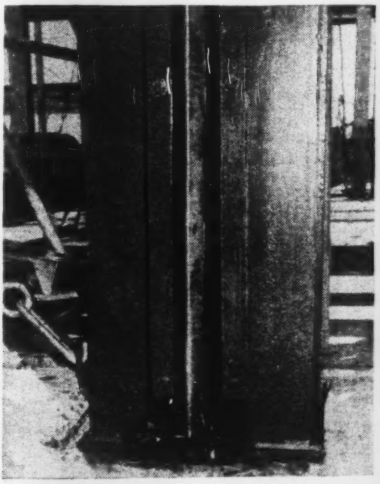


Fig. 3. Flashing at the double-column expansion joint is a V-crimped copper sheet held by steel strips bolted to the columns. The pan at the bottom is for disposal of accumulated moisture.

Having about the same dimensions as T20 but with only one diagonal in each 8-ft. 4-in. panel and verticals at each panel point, T65 had a 10-in. WF 112-lb. top chord about 50 ft. long, with two 8⅛ x ½-in. shear plates for the full length. It had an 8-in. WF 67-lb. lower chord, with two 6⅝ x ½-in. shear plates along 19 ft. 4 in. of the center portion. The end diagonal was an 8-in. WF 67-lb. beam with two 6⅝ x ¼-in. shear plates, the adjacent diagonal 8-in. WF 58 lb. and the center diagonals 5-in. WF 13.5 lb. Composed of two 4 x 4-in. angles, machine butt-welded to form a Z shape, the verticals were ⅜ in. thick at the first and center panel points and ¾ in. at the second panel point from each end. The load was applied at the third points in increments of 54,000 lb. per pair of jacks, up to 270,000 lb. when the deflection was 1½ in. Here, too, the set was negligible upon removal of the load.

Transmitter building data

The transmitter division building in which these roof trusses are used is about 300 ft. wide and 730 ft. long, with most bays 40 x 50 ft. Trusses of the T1 type are spaced 16 ft. 8 in. apart, supporting 10-in. 11-lb. two-span joists and 10-in. 15-lb. single-span light beams. Totaling 70 psf., the roof load consists of 40-psf. live load, 5-psf. roofing, 1-psf. insulation, 12-psf. lightweight-aggregate-concrete tile, 2-psf. mechanical work, 2-psf. purlins, 3-psf. cross trusses and 5-psf. carrying trusses. Expansion joints of the type shown in Fig. 3 are spaced about 240 ft. apart.

Supervising the tests were L. I. Bruce and C. L. Kreidler of Lehigh Structural Steel Co., W. R. Pressler and S. B. Barger of Pittsburgh Testing Laboratory, H. L. Waugh of Giffels & Vallet, Inc., and L. Rossetti, Associated Architects and Engineers, and E. R. Sangster of General Electric Realty Corp.

Friction Effects in River Models

Thomas A. Epstein
**Lecturer in Engineering, The Borough Polytechnic
London, England**

CORRECT REPRODUCTION of friction in models of rivers and tidal estuaries is a problem not easily solved and has caused considerable trouble in model experiments. In spite of this, very few experimental data are available for the complete solution of this problem. The following analysis is proposed both as a temporary answer and to indicate a line of experimentation that should lead to the required result.

Friction effects in channels can be assumed to be due to two causes: Shape friction(namely, losses due to tortuous meandering and changes in cross-section); and skin friction.

It is usual that the Reynolds number of model channels is still sufficiently large to ensure that fully developed turbulence exists, and therefore Reynolds number effects on the flow pattern are relatively small. Also, as vertical velocities are usually quite small, we may neglect the error introduced by the exaggeration of depths in these velocities. Therefore, it may be expected that a reasonably approximate solution would result from an analysis of the second friction effect, skin friction.

In the following analysis the symbols used are those shown in the *Manual of Engineering Practice*, No. 25, (Hydraulic Models) of The American Society of Civil Engineers.

Geometrical Similarity, as far as it can be applied to a distorted model, requires that for the bed slope and the water-surface slope the scale ratio for the model to the prototype should be

$$S_r = \frac{S_m}{S_p} = \frac{y_m}{L_m} \cdot \frac{L_p}{y_p} = \frac{y_r}{L_r} \qquad \text{(1)}$$

which is the exaggeration of the vertical scale, E.

Dynamic Similarity requires that the above slope scale should be the same as the scale ratio of the energy gradients as given by such a formula as the Manning.

$$V = \frac{1.486}{n} R^{2/3} S^{1/2} \qquad \text{(2)}$$

The velocity scale ratio (V_r) is given by the Froude Law,

$$\frac{V^2_p}{y_p} = \frac{V^2_m}{y_m}, \text{ i.e. } V_r = \frac{V_m}{V_p} = \left(\frac{y_m}{y_p}\right)^{1/2} = y_r^{1/2} \qquad \text{(3)}$$

If the channel is relatively wide, the scale ratio of hydraulic depths (R_r) will be almost the same as that of vertical distances. Hence,

$$\frac{R_m}{R_p} = R_r = \frac{y_m}{y_p} = y_r \qquad \text{(4)}$$

On substituting these in the Manning formula (2), the scale ratio of energy gradients becomes

$$\frac{S_m}{S_p} = S_r = \frac{V^2_r . n^2_r}{R_r^{4/3}} = \frac{y_r . n^2_r}{y_r^{4/3}} = \frac{n^2_r}{y_r^{1/3}} \qquad \text{(5)}$$

Several observers have agreed that the Manning rugosity coefficient, n, is a power function of the magnitude of the wall protuberances, d, which in the case of models can be taken to be the diameter of the grains of the particular bed material used.

A reliable deduction of this power function was found experimentally by Strickler (Beitr. zur Frage des Geschwindigkeitsformel und der Rauhigkeitszahl für Strome, Kanäle, u. geschlossene Leitung. *Wasserwirtschaft*, Bern, 1923). His result, that $n \infty d^{1/6}$, is particularly convenient as, in the first place it makes the Manning formula dimensionally correct, and secondly because the effect of "relative roughness", d/R, becomes apparent in a manner that might be expected:

$$V = k\left(\frac{R}{d}\right)^{1/6} R^{1/2} S^{1/2} \text{ where } k \text{ is a true constant} \qquad \text{(6)}$$

Combining the Strickler result with equation (5) gives:

$$S_r = \left(\frac{d_r}{y_r}\right)^{1/3} \qquad \text{(7)}$$

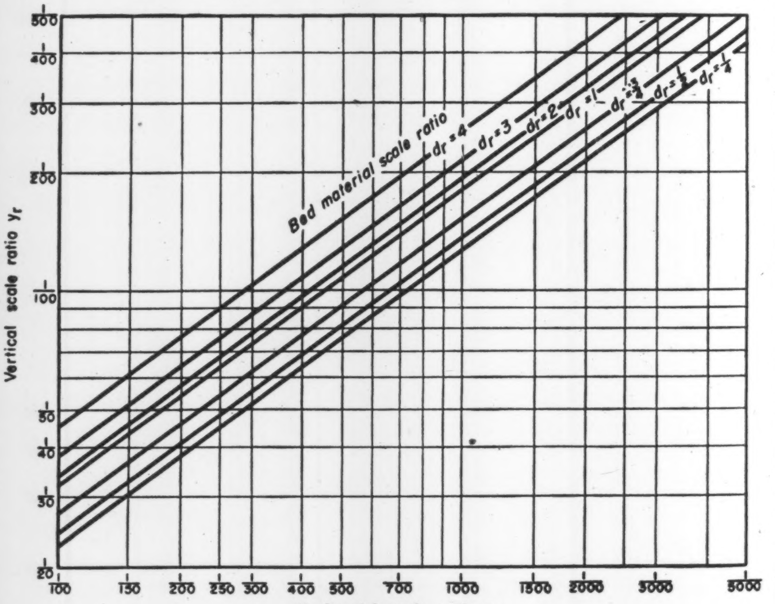
In order that the two equations for slope, (1) and (7), should give the same result it is necessary that:

$$S_r = \left(\frac{d_r}{y_r}\right)^{1/3} = \frac{y_r}{L_r} = E \qquad \text{(8)}$$

Equation (8) represents the requirements demanded by similar bed friction in hydraulic models. It may be expressed in a more useful manner to give the correct bed material scale ratio required by particular horizontal and vertical scales used:

$$d_r = \frac{y_r^4}{L_r} = E^3 y_r = E^4 L_r \qquad \text{(8a)}$$

This equation is represented in the graph below.



Scale ratios for hydraulic models of rough channels are found in this graph.

WHAT CAN BE DONE ABOUT HIGH CONSTRUCTION COSTS

Contents in Brief*—Finding out what can be done—and by whom—to lower and control construction costs was a task undertaken recently by the staff of** Engineering News-Record ***when it became apparent that mounting costs were definitely stopping seriously needed new building work. Of prime importance to lower costs is elimination of multiple-time work. This requires concerted action by workers, contractors and buyers of construction services, but responsibility for it lies chiefly on those among the buyers who insist on getting their job done immediately without regard for the effect of that speedup on other construction operations. No less urgent is elimination of jurisdictional strikes and featherbedding. Responsibility for this rests squarely on the unions. Productivity of labor also must be increased. Here responsibility is shared by manufacturers of construction materials and distributors as well as labor, for workmen are inclined to slow down when only a limited supply of material is in sight. In addition manufacturers and suppliers have an obligation to keep material costs down. Finally, contractors can help by a little pencil sharpening and more efficient planning.

RIGHT NOW we have the anachronism of thousands of carpenters, bricklayers and others, 20,000 in New York City alone, walking the streets looking for work while their families, and others look for homes and business quarters that these same men could be building.

The reason for this condition is plain—construction costs have risen above the point of reasonable return on the investment, and as a consequence, purchasers are refusing to buy construction services. They are refusing as shown by building permits which, for 215 cities, reported by Dunn and Bradstreet, *on a dollar basis,* are 45 percent lower for March, 1947, than for March, 1946, and are 33 percent lower for the first three months of 1947 than for the corresponding period in 1946. They are refusing as shown by the *ENR* reports of contracts awarded for private civil engineering construction, largely buildings, which *on a dollar basis,* were 39 percent less in April 1947 than for April a year ago. On a volume basis, because of the rise in costs, 1947 construction awards are even farther behind 1946 than the dollar figures show.

Much proposed construction

It is neither lack of need nor lack of plans for new work that is delaying construction awards. This is shown by the *ENR's* reported backlog of proposed private construction, which increased $4½ billion from April, 1946 to April, 1947 to a present total of nearly $10 billion of plans in the blueprint stage or ready for contract. Total reported backlog of construction work is about $38 billion. Meanwhile, construction employment, which normally increases rapidly in the spring, is still 250,000 below last year's average.

Thus, despite a great need, despite the proven resources of American builders to handle successfully almost any construction problem, despite availability of capital seeking an outlet in construction projects, accomplishment is falling off. If a decrease in construction volume should result in a depression, few can gainsay it was of our own making.

Just exactly where does the fault lie? What can be done to correct it? And by whom?

Seeking answers to these questions, *Engineering News-Record* editors have made a coast-to-coast inquiry that included labor leaders, contractors, government construction agencies and suppliers of construction materials. The results are enlightening and point to definite corrective measures.

Briefly, multiple-time work—frequently instituted only to obtain or to hold workmen—and lack of materials—perhaps the major factor in low productivity—are the most frequently given and best substantiated reasons for high construction costs.

Contractors strongly assert that material prices must be reduced; purchasers feel that contractors' profits can be cut; and all except the immediately affected unions feel that jurisdictional strikes and featherbedding must be eliminated. High taxes, too, are frequently cited as a major factor in high construction costs, yet there is general acceptance of their necessity.

There is little support for a belief that construction cost reductions greater than 10 to 20 percent below present levels can be achieved short of a depression. There is definite feeling that a reduction in the living costs of workmen, as represented by food and clothing for example, would have a beneficial effect on construction where costs, by comparison, are not so greatly inflated.

Nevertheless, it appears certain that

AN ENGINEERING NEWS-RECORD STAFF REPORT
MAY 29, 1947

if a cure for the price difficulties facing construction is to be effected before the slump in construction contributes to other maladjustments in the country's economy, it can come only from a sincere cooperative effort on the part of purchasers of construction services, suppliers of construction materials, contractors and the workers. The elements of such cooperation are many. To understand them the situations that face each component of construction should be recognized. First, there is labor.

LABOR'S OPPORTUNITY AND RESPONSIBILITY

Five problems may be recognized as involving a responsibility on the part of organized labor. They encompass wage rates, overtime, sanctity of contracts—with which may be included jurisdictional strikes—restrictive practices, and worker productivity, including the related question of apprentice training. Inquiry on each of these problems was a part of the *ENR* survey.

Wage rates, in general, are not regarded by either contractors or unions as the weightiest factor in determining the trend of construction costs, even though wage increases are a subject of contention and adjustment in many areas today. In sections of the country where contractors' associations and building trades' councils have built up long records of fair and honest cooperation, it is agreed that current construction rates are not out of line with national wage trends; it is also agreed that reasonable increases this year are justifiable to meet higher living costs and maintain the economic position of the building trades with respect to other industries.

As typical of such conditions, Chicago contractors and unions have agreed upon wage increases for this year averaging 10 percent, most of them to take effect June 1. Both the contractor employers and the unions regard the increases as fair and reasonable. Under the new scale, bricklayers and structural ironworkers will receive \$2.20 per hour; carpenters, cement finishers, hoisting engineers and ornamental iron workers, \$2.15; plasterers \$2.22½. The rates for building laborers will be \$1.50.

In southern California recent renewals of wage agreements to cover the year beginning May 1 increased wage rates 20 to 25 cents per hour, or an average of about 12 percent. Wage agreements for other West Coast cities have just been negotiated.

Despite amiable relations, however, the trend toward higher wage rates is causing trouble, more in some areas than others. An electrical contractor in San Francisco, for example, points out that after adding his nominal overhead of about 20 percent, another 8 percent for social security and workmen's compensation insurance, and a small profit, the prevailing selling rates on journeymen electricians' wages comes to \$3.50 per hour.

"Because of these high costs", this contractor reports, "a great volume of work that should be done is not going ahead. This is understandable, when it is realized that the general public, which must eventually pay these costs, is made up of people whose average earnings are far below the building trades scale."

In the Kansas City, Mo., area, a recent survey by the Builders Association showed that, of all work projected a few months ago, one-half had already been definitely cancelled or indefinitely postponed. The survey indicated that further increases in building costs would cause greater cancellations. As a result of this investigation, the contractors refused to grant union demands for a 25-cent per hour increase. A building trades strike resulted.

About \$50,000,000 of work under construction is halted in the Denver area as a result of a wage dispute. Prior to April 1, expiration date of labor contracts in the area, the employing group in the construction industry offered a 10 percent increase to all crafts. The majority of the crafts were willing to accept the increase, according to Denver General Contractors Association, but the trowel trades refused the offer. The general view of the contractors in the area is that a 17½-cent per hour increase across the board would be most equitable.

An entirely different wage situation exists at Houston, Texas, where owners have balked at paying high construction wages resulting from a 25-cent increase for all trades demanded the first of the year. These increases produced wages among the highest in the country and led to blunt refusal by large industrial owners to do any building under wage rates in excess of \$2 per hour, except

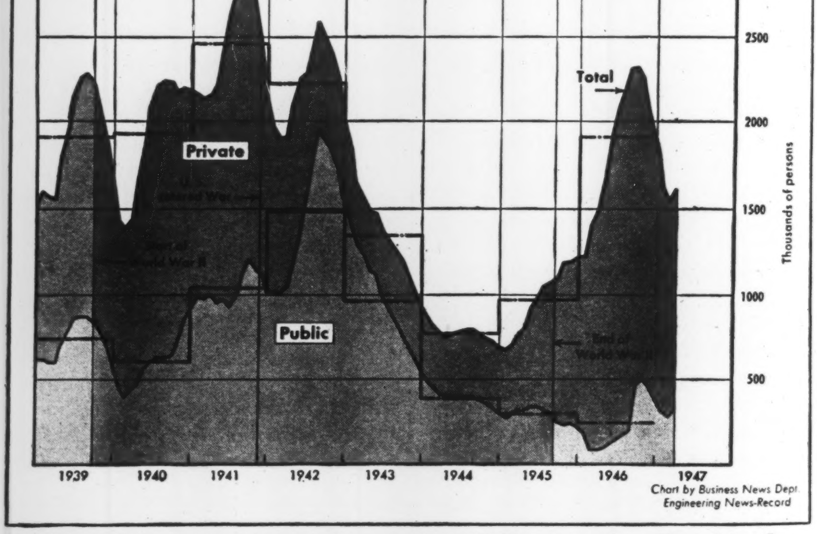


Chart by Business News Dept.
Engineering News-Record

Employment in construction has shown only a slight upturn since the winter low. Straight lines on the chart indicate yearly averages.

$2.25 for bricklayers. Other owners strongly resisted the increased labor cost. The first result was that most Houston home builders dropped the union contracts, which they had entered during the previous year or two. The second was that labor took a second look.

The ironworkers union was the first to act, entering into an agreement with the Houston Chapter of the Associated General Contractors of America calling for a reduction in its wage rates of 12½ cents per hr. Other crafts took up consideration of similar wage cutbacks.

In metropolitan New York, where wages have been consistently higher than elsewhere in the country, a wage rate of $2.50 per hr. for most crafts was adopted, largely in exchange for an agreement with the workers, for a uniform 8-hr. day. The metal lathers (who place reinforcing steel as well) the plumbers and some others, did not become a party to the "master agreement." The lathers were recently awarded $2.30 per hour for a 7-hr. day, but they hope to work the eighth hour on double-time rates, giving them an average of $2.59 for 8 hours. The plumbers agreed to work an 8-hr. day at $2.81 per hour. And now, the bricklayers have won another round to $2.75 per hour, effective June 30, while other crafts are agitating for further rises. Concurrently, 15,000 workmen are said by the Building and Construction Trades Council to be out of work in New York City while numbers in excess of 20,000 unemployed in construction are given by other sources.

Thus it goes. Demands for increased wage rates continue. In the meantime, many purchasers of construction services are refusing to build, and those who venture are looking for ways to reduce the number of on-site workers.

Multiple-time increases cost

Wage rates, however, are only part of the story. Another part relates to overtime. Universal return to the 40-hr. week is the greatest single step that could be taken to reduce job labor costs of building construction, according to views expressed by labor leaders and contractors throughout the country. In the Chicago area, the Building and Construction Trades Council advocates a return to the straight 40-hr. week without overtime, and union members generally support this position; being human, however, many of them can be tempted to accept double-time pay for Saturday and Sunday work.

Bribe to get workers

The double-time requirement originally was inserted in union agreements at the demand of the building trades as a penalty to discourage overtime employment. It is now the great magnet used to bribe workers to come to, or stay on, a job. Increasing the take-home pay as it does, "double time" plays a big part in bringing about the demands for rate increases since the unions want hourly rates set to yield the same return to the worker if only a 40-hr. week is to be worked.

An organization making a determined effort to eliminate all overtime is the Building Construction Employers' Association of Chicago, which in a recent letter to its members wrote: "Effective June 1, 1947, we ask all members to observe and abide by their labor agreements which call for a five-day, forty-hour week. Competition for mechanics, by offering more hours per week and other inducements, has accomplished nothing but to raise the labor cost on all build-

WAYS TO KEEP CONSTRUCTION PRICES DOWN

What Owners and Engineers Can Do

Simplify design—eliminate hand work.
Plan with contractor to specify materials now available and to use processes that require the least on-site labor. (For example, preassemble siding where brick and bricklayers are difficult to obtain).
Contract fixed-price work in units that can be completed in one working season.
Select a contractor currently active in the field desired, who has an organization available for the work.
Allow time to build without overtime.
Put competent men in charge in the field and give them authority.
Work for improved building codes.

What Contractors Can Do

Encourage better job relations—make labor a partner.
Re-examine management (there may be need for new blood).
Keep up with and carefully appraise new processes—precasting, for example.
Work with the engineers during the planning period.
Carefully plan work for minimum of one-site labor.
Plan efficient layout and equipment use.
On fixed-price work, desist from figuring a profit on the percentage for contingency.
Start the job when materials are available for continuous work.
Resist all multiple time work.
Fire somebody sometime. It might help both management and workers to find it can be done.
Keep the job safe—it's the cheapest way to build.

What Materials Manufacturers and Suppliers Can Do

Establish firm prices.
Route materials through established channels.
Develop materials requiring less on-site work.
Help plan use of alternate materials.
Give only dependable delivery promises.

What Construction Workers Can Do

Settle all jurisdictional disputes without strikes.
Accept and train apprentices
Work uniform hours without overtime in all crafts.
Eliminate "featherbedding," such as hoisting engineers and electricians who only sit by while machines run, and non-working foremen who supervise one or two men.
Stand back of wage contracts.
Elminate secondary boycotts.
Give a better day's work for a better day's pay (a union card gives a right to work—not to steal time or productivity from an employer).

ing operations. A few contractors, who inaugurated this procedure in order to rush completion of their own work, have brought about a condition of chaos and uncertainty in the whole building industry that has reached such proportions as to slow down and will eventually stop new building operations."

Employee organizations, like the Chicago and Cook County Building and Construction Trades Council and the Chicago Metropolitan Home Builders, are in accord with the action. They hope to get the cooperation of owners and mortgage bankers whose demands for Saturday-Sunday work are a basic cause for the overtime trouble.

Saturday work expensive

It has been pointed out that while working a sixth day at the double-time rate theoretically adds only $16\frac{2}{3}$ percent to the payroll cost of a job, actually it increases the labor cost by a larger percentage due to a decrease in overall productivity. This lowering of efficiency results in an increased job labor cost of 18 to 30 percent, according to one contractor, while spokesmen for the unions contend that labor costs on many jobs can be reduced 25 percent by elimination of Saturday work.

California now is operating under a firm agreement between contractors and the six basic crafts organizations —laborers, cement finishers, teamsters, pile-drivers, operating engineers and carpenters—on uniform conditions of hours. Because of different requirements in the heavy construction industry (as distinct from building construction), the length of time worked per week is different in these fields, and under the agreement each has its specific and definite standards.

On heavy construction (highways, dams, bridges and the like), where the contractor has a considerable investment in machines or pays a high rental, his costs increase if the equipment is idle. Frequently, therefore, it is economical to keep equipment working on Saturday. Furthermore, many of the heavy construction jobs are "out-of-town" and workers prefer to avoid idle time. Thus, both labor and contractors on heavy construction favor a 48-hr. week of six 8-hr. days with time and one-half for the 8-hr. Saturday overtime. This is as far as the overtime goes, however. There is no longer Sunday and holiday work, which presumably would have to be at double-time rates. An important point is that in California these conditions are uniform over large areas.

In California building construction, largely in or near towns and where heavy construction equipment is not used extensively, the week of five 8-hr. days, with no overtime, has been agreed upon by both labor and contractors. Like wages, other working conditions are standardized by agreement, thus making for a uniform basis accepted by all. Under such conditions there is no inducement for labor to migrate from one job to another to obtain higher wages or more overtime.

Somewhat similar conditions prevail in the Pittsburgh area where an estimated 50 percent of the heavy construction jobs work Saturday and pay time and one-half for the sixth day in a 48-hr. week. On building construction, Saturday work would have to be at double time as would Sundays and holidays on both building and heavy construction. At present, no building work is under way in the Pittsburgh area on any of the double-time days.

Rate changes a serious factor

Higher wage rates and excessive overtime, therefore, are two causes for the high cost of construction for which labor has some responsibility. A related responsibility is the breaking of contracts and promises. Any contractor once hit by unexpected increases in labor rates after a job is bid, is sure to put a large mark-up for such a contingency in his next estimate.

It is common practice for the unions, when negotiating for a raise, to promise to continue to supply men at the rate under which going jobs were bid. Leaders usually try, and men are patient for a time, but it just doesn't work for long; soon the contractor is forced to accept the new rate to keep workmen. Use of a financial responsibility arrangement

WORKING RULES ON RESTRICTIVE PRACTICES

Kansas City contractors asked recently that the following rules on restrictive practices be made part of new union agreements. Many unions voluntarily include such rules in their working agreements.

There shall be no restriction on the amount of work performed in a day.

The contractor shall determine the number of foremen to be employed on any job and shall decide whether a foreman is to work with his tools or devote his time to direction. A contractor shall have the privilege of employing any member of a union in good standing as a foreman.

Small jobs shall not be required to have a foreman.

Each workman shall perform a real service on the job. For example, contractors shall not be required to employ operating engineers for specified unnecessary services (four of which are listed).

A steward shall be required to do a full day's work and shall be subject to discharge the same as any other employee when his services are not satisfactory.

The contractor shall not be required to employ mechanics to perform work that does not require skill. Materials shall be unloaded and handled on the job by common labor unless management deems it advisable to have mechanics assist.

It shall be permissible to perform all work in the most economical manner, as, for example, to glaze windows and doors in the factory.

There shall be no restriction on the use of labor-saving tools or equipment.

has been suggested, under which a portion of raises granted would be collected and used to reimburse the contractors on jobs bid under a lower wage rate. Such an arrangement would reduce one serious "contingency" item in today's high costs.

No consideration of labor's responsibility for high construction costs can omit the question of restrictive practices and "featherbedding" since they involve needless employment and pay for work not performed. Specific admissions of such practices are difficult to obtain from representatives of labor.

Union leaders deny that there is any restriction on quantity, yet shop stewards and others all too frequently require the pace of the slowest to be the criterion of production. One excuse given by union leaders for slow construction is the high average age of workers—well over 50 years in most trades. Men of these ages and commensurate skills have in the past done the finish work where good workmanship rather than speed has been the requirement. A related fact is that relatively few younger and speedier workmen have been admitted to some unions.

Restrictive practices

Restrictive practices vary with localities and even with interpretations. For example, on a tunnel job a contractor complained that drill runners were refusing to start a second round of drilling despite ample time in a work shift. On another heading on the same project, the depth of drilling and shooting was set at the maximum round the crew could be expected to complete and clean up in a shift; going home after the round was completed was offered as an incentive.

In areas that have been organized for a long time it is a common practice to require the use of hoisting engineers on such machines as compressors and pumps that need no mechanical control except starting. An oiler, who works perhaps half an hour twice a day, is required on a crane; a master mechanic for each four or five hoisting engineers is often specified in union rules. In some areas a crane operator can work on only one machine in a day; in other words, he cannot use a crane in the morning to set forms then run a shovel in the afternoon; there must be an operator and oiler for each machine. Electricians sometimes are required on a motor merely to throw a control switch in the morning and again at night.

Featherbedding at $1,300 a week

A serious example of this type of featherbedding occurred in New Jersey in February of this year. A building under construction was supplied with low pressure steam from an existing plant. A system for temporary heat was completely installed by union mechanics and consisted of supply and return mains and electrically operated unit heaters. This type of system requires very little service maintenance by mechanics if under "round the clock" operation.

In spite of dearth of mechanics which made necessary overtime premiums for manning the mechanical portions of the contract, three local unions insisted that their members stand by constantly while the system was in operation. This involved the employment of one electrician, one steamfitter and one hoisting engineer for non-productive purposes on a 24-hour basis, seven days a week with a total payroll expenditure of $1,308 per week for a period of ten weeks. National officials of the unions ignored pleas for relief.

One general practice that is unusually serious on construction is the requirement that a man be on hand or come to a job for only a few minutes work to do some task another craftsman could do as well, such as setting a metal sleeve in concrete. Another example is a requirement in New York City that a reinforcing rod setter stand by while concrete placing is in progress even if there is only a rod or two to be set in the course of several hours work. Another restrictive practice on rod setting in New York City is the requirement that all reinforcing be bent on the job while the general, and more economical practice, is to buy the rods from a supplier "bent, bundled and tagged."

The secondary boycott—refusing to install articles made, assembled or sold, by others—is also a restrictive practice that increases cost unnecessarily. Restrictive practices that have been found most expensive and irksome are shown in the accompanying table outlining points on which builders in Kansas City are asking relief.

Finally, of the five labor problems that have a bearing on high construction costs, productivity of the worker is one of the most significant. There is ample evidence to demonstrate that productivity is lower than prewar, and there are many recognized causes, although the relative weight of each is hard to determine. The advanced average age of workmen, already mentioned, is one. Another, on which both management and labor agree, is the lack of sufficient materials to assure continuous employment. Workmen have a natural reluctance not to "work themselves out of a job"; frequently they are encouraged in this attitude by supervisors and owners who have told them to make the materials last, for fear that if the workers leave the job they will find employment elsewhere and will not be available when needed. Slowdown habits, once acquired, are difficult to eradicate.

Efficiency curve turning up

Productivity, nevertheless, has improved over the first postwar year, and there are signs that further improvement is in prospect. One of these is that for the first time in years there is now a body of unemployed construction labor. So long as workers are waiting to take jobs, the men holding those jobs have a real incentive for more and better work. The trend to increased efficiency has been under way for too short a time to show up much in cost figures or in questionnaires to executives, but, according to foremen working directly with the men, such a trend is, discernable. Without figures to support their statements, several prominent western contractors agree that efficiency of construction workers in northern California has increased perhaps 10 to 20 percent in recent weeks.

The general situation is illustrated by conditions in southern California, which reports an adequate supply of craftsmen in the construction industry with the exception of two or three of the sub-crafts. Under recent working agreements, the contractor has the right of selection of men sent out by the unions. This indicates that efficiency is again becoming a factor in securing and holding a job. In one of the principal crafts in southern California, it is rumored that the union has expelled a considerable number of members for inefficiency. This sort of disciplinary action, if the example were to be widely followed, would contribute greatly to decreased construction costs.

Productivity is closely related to apprentice training, which adds young, ambitious workmen to the labor supply. Under the "G. I. Bill of Rights" interest has been stimulated in apprentice training and there has been a tremendous upswing in the number enrolled as apprentices in the building and construction trades.

According to U. S. Department of Labor statistics, a total of 95,000 apprentices are enrolled under "Building Trades" classifications. California has about twice as many apprentices enrolled as any other state, with some 18 percent of the total. There are said to be 3,700 carpenter apprentices in the Los Angeles area and 2,500 in the San Francisco Bay region under the direction of a joint committee representing both management and labor. In addition to this favorable prospect for future journeymen carpenters, limitation on the permissible ratio of carpenter apprentices to journeymen carpenters has been largely removed.

In Chicago, contractors speak of the splendid cooperation of the unions, many of which have increased the ratios of apprentices to journeymen beyond those existing for many years. Some unions have reduced apprenticeship time requirements and issue cards to men who prove their ability.

Union leaders report that the larger contractors in Chicago have given excellent cooperation in indenturing apprentices. Contractors admit that any deficiency in apprentices in the Chicago area is due more to them than to unions. Restrictions and regulations governing construction, they say, make it difficult for the contractor to be sure of having adequate work for continuous employment for indentured apprentices.

An example of manufacturer activity in the field of apprentice training is the work of the Structural Clay Products Institute in promoting training of bricklayers. The institute has five full-time union bricklayers on its staff who help initiate training courses, usually in connection with local trade schools.

Some contractors have pointed out that the alternative to developing a dependable, hard-working reservoir of construction labor is to increase immigration quotas. Many of the skilled men still in construction received their training in Europe prior to World War I. These workmen are now more than 50 years old.

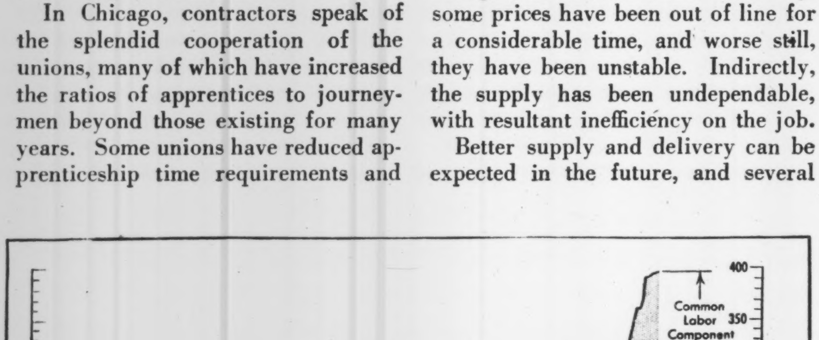
MATERIALS A BIG FACTOR IN COST

From the foregoing it is apparent that labor has a number of responsibilities in the construction cost field and an equal number of opportunities to discharge them more creditably than in the past. But labor is not the only construction component that is too costly.

Materials represent perhaps half of the total cost of a job, and directly and indirectly they have added to rising construction costs. Directly, some prices have been out of line for a considerable time, and worse still, they have been unstable. Indirectly, the supply has been undependable, with resultant inefficiency on the job.

Better supply and delivery can be expected in the future, and several factors indicate a trend to stabilized cost of materials. They include the better supply available; wages in the manufacturing field fixed for a year; and some embarrassment over the profit percentage reported by manufacturers in year-end and first-quarter financial statements.

A few industries serving construction already have announced firm prices, eliminating the need for contractors to take the risk of rising material prices along with other contingencies. Under current conditions of billing at prices on date of shipment, the contractor can only guess at what the price might be. As a consequence, some figure for contingencies and add percentages for profit to these inflated figures, all of which contributes to the present high cost of construction.



Engineering News-Record's indexes of building and construction costs appear to be leveling out as construction slows from high costs.

Many hands raise prices

Contractors attribute some of the current inflated cost of materials to the fact that they frequently move into the hands of speculators rather than following usual trade channels. Each handling adds a percentage to the cost. Plywood is said to be a current example of such a condition as are steel door and window frames.

Increasing production plus decreased consumption—resulting from buyer resistance to high prices—have produced in recent weeks an adequate or even excess supply of some materials, particularly those that are not economical to move long distances. Some structural tile yards in the Midwest have shut down. Prices for construction grades of lumber right now are on a toboggan, with retail dealers buying only for immediate delivery, to avoid inventory losses on a falling market. With residential building in the East off at least 30 percent, prices for this class of lumber have dropped the same 30 percent, with continuing decline expected. But, flooring and other materials that require more manufacturing work are still high priced and scarce.

Producers of materials in fields where supply exceeds the demand can: (1) produce for inventory, (2) cut production, (3) reduce price. Producing any considerable amount for inventory is being curtailed by refusal of banks to make large loans on stocks produced at inflated costs.

CONTRACTOR'S BIDS ARE A COST FACTOR

Higher wage rates and higher maetrial costs automatically have made it necessary for contractors to bid higher. Less can be done about these than can be done about other factors tending to push contractors' bids up such as low labor productivity and uncertainties about material deliveries and future prices. Some contractors believe that these can be offset in some measure by a careful determination of the availability of materials when bidding on a job and by recommendations to the owner as to possible substitutions. Also, it is believed that costs can be cut by getting the owner to authorize a delay in the start of a job until a satisfactory flow of needed materials is assured.

More attention to the building of an efficient labor force through better labor relations is believed to be a way in which worthwhile savings can be made.

Short-term contracts reduce risk

State highway departments have found that more favorable bids can be obtained by subdividing a job into contracts that can be completed in a few months, thus eliminating the element of risk involved in having to anticipate what labor rates and material prices are to be a year or more ahead. The same system might well be applied to other types of construction work.

Similiary, better bids have been obtained on some projects through the use of escalator clauses to protect the contractors against heavy loss due to unpredictable rises in labor or material costs. These clauses have made it possible for contractors to reduce their item for contingencies to a more normal amount.

There appears to be some justification for the criticism directed toward contractors for basing their allowance for profit on an estimate that includes an abnormal amount for contingencies, thus giving them an unusually high profit when prices do not rise sharply during the construction period.

Engineers who are experienced in preparing estimates for construction work believe that contractors' bids are so high as to indicate that many contractors still are making estimates on the liberal basis used in the war days and that they could help to bring costs down by "sharpening their pencils a bit". Undoubtedly, some reductions could be effected in this manner.

A revival of the "cost-plus-a-fixed-fee" basis of letting contracts which was widely used in the war years when costs were rising sharply, is frequently employed as a means of eliminating the high figure for contingencies now in fixed-price bids.

PURCHASER PRESSURE FORCES PRICES UP

The last component in the construction picture is the owner or the purchaser of construction service. Is he just an innocent bystander or is he in some measure responsible for high costs?

There is general agreement that purchaser actions or demand have in all too many cases motivated both high prices and bad practices. For example, advertisments appeared throughout one state recently asking for construction men at $4 per day over the union scale for work in a particular city. The contractor who thus undertook to break established rates explained that the owner of the building under construction wanted the work done by an early date or he would take over and complete it with forces hired directly. Cost of completion was no particular object—the owner wanted the building as quickly as possible.

Disregard of cost forces wages up

Such action tends to force up all construction wage rates because when bargaining for new contracts comes up, laborers point out that the inflated rates are the going rates and that increases must be figured above them. And although most far-seeing union leaders would prefer to see wages stabilized, yet for internal political reasons they cannot deny to their members the maximum pay they can get without risking their leadership of the organization.

There are many things that purchasers of construction services and their engineers can do to reduce the current cost of building. Most important, undoubtedly, is to refrain from forcing a job into overtime work with consequent lowered productivity and frenzied procurement of materials at any cost. Thoughtful designing is another source of economy. Use of standard modular units, for example, is said to decrease cost of brickwork by 20 percent.

Letting the prospective builder participate in the planning discussions has been proposed as a means for getting an economical job. The builder is often in a better position than even the best informed engineers to advise on what materials are available and frequently on those most economical to place in the structure. The contractor as he is estimating the work, can point out expensive and non-essential ideas—for example, hand rubbing of concrete walls at 20 cents per square foot.

Conclusions

Many interests, including some labor leaders, feel that a mild recession in volume of work put under construction will have a salutary effect on costs and will be far better than the "boom and bust" condition with which the construction industry might otherwise be faced. Certainly, a slackening of demand will improve the material supply and delivery situation—particularly in structural and reinforcing steel as well as plywood, which still are in critically short supply. Improved material supply in turn would alleviate to some extent low productivity of workers. Higher productivity would decrease some of the owner demand for overtime.

Forcing a job into overtime is cited by contractors and by labor leaders as a most potent cause of high construction costs. It directly increases unit costs as much as 25 percent; it slows average hourly output; it creates take-home pay differences, which result in dissatisfaction of not only construction labor but of all other labor; and it keeps workers moving from job to job.

Greater productivity and decreased multiple-time pay are the factors that offer the most obvious opportunity to cut costs in the field. Improved material supply also will encourage firm prices, as well as reduced prices on some items. And elimination of uncertainty in wages, overtime and prices will reduce greatly the contingency items in a contractor's bid or in an owner's estimate of costs.

Thus, an improved material supply, achieved by greater production and better distribution or reduced demand, seems essential to controlling costs on construction. But this will not be effective if purchasers insist on getting a job done regardless of cost.

Whether we go ahead or stall on construction seems now to depend on whether or not we can develop a sincere cooperative effort on the part of purchasers of construction services, manufacturers and suppliers of construction materials, the contractors who manage the construction and the workers who actually build the job.

Utilities of Texas City Withstood Catastrophe Well

Despite the tremendous damage done to the dock area of Texas City, Tex., following the explosion of the ammonium nitrate-laden freighter "Grand Camp" on April 16, comparatively small disruption occurred in the city's public utility systems, according to *Engineering News-Record's* staff news correspondent at the scene.

Officials of the telephone, gas, water and electric power systems consider that the community was fortunate in escaping worse interferences with utility services. Phone company men estimated that financial loss would be about $24,000 including damage to aerial cables and shattered glass in buildings. The Houston Natural Gas Co. shut off its 16-in. feeder immediately after the first explosion, conducted an investigation and was able to return gas to the mains the same day.

Disruptions in the supply of water and electric power were relatively small and that service was largely restored within 24 hours, excepting in the stricken dock area. No pollution of the water supply was reported, although two chlorinators were held ready if contamination were found.

After the first explosion, engineers of the Houston Natural Gas Co. reported that the 16-inch gas feeder into Texas City was closed until crews could turn off all gas meters to avert possible explosions and fires at points of consumption. Inspection was completed the same day and gas was returned to the mains. A 1¼-inch gas line a half mile from the explosion was cut at a depth of 14 inches underground by a flying steel fragment. Damage to the gas company's brick office, about a mile from the docks, consisted largely of shattered windows.

Little damage to water lines

Spokesmen of the Community Public Service Co. in Texas City said that disruptions in the supply of water and electric power were relatively small and that service was largely restored within 24 hours except in the stricken dock area. Inspection crews found the only mains to be broken were a 6-in. cast iron line in the west end and a 2-in. line in the vicinity of the Monsanto Chemical Co. plant near the docks. Few leaks in the mains were found, but many were encountered inside dwellings. The city of Houston sent two chlorinators to Texas City to cope with possible contamination of the water supply, but no pollution was reported.

All breathers on all transformers at the main substation were blown out and considerable oil lost from transformers but no other damage occurred at the substation. The Houston Light and Power Co. sent six crews to aid in inspection and repair of the power system, which was restored substantially to normal on the day of the first explosion, although numerous service lines, most of them in the dock area, were down.

Damage to the small wooden dwellings and to industrial structures within a quarter mile of the docks, which lie south of Texas City, was devastating. Hardly one dwelling escaped serious damage, and in most of these, roofs were blown off or collapsed and walls blown out by the terrific concussions of the three explosions. At the docks, seven warehouses in a 1,200 ft. by 1,600-ft. area around the waterfront were demolished. These buildings were principally built with concrete floors and steel superstructures with corrugated sheet steel sidings and sheet roofs. Outside this group, five other similar warehouses, including an office of the Texas City Terminal Railway Co., were likewise destroyed or seriously damaged. The farthest of these was a half mile from the docks. A large sea-train crane used for transferring freight cars between barges and the docks, was a crumpled skeleton of ruined steel girders and machinery.

Officials of the Monsanto Chemical Co. have declared that practically the entire plant where the company was manufacturing styrene was beyond salvage. This plant was only a few hundred feet from the north slip, where the explosion of the freighter Grand Camp set off the disaster.

Australian Practice Favors . . .

Water Pipeline on the Desert Floor

McGraw-Hill World News
Melbourne Bureau

***Contents in Brief**—Construction of an above-ground pipeline—223 mi. long, varying from 30- to 21-in. in dia., and rising to an elevation of 1,558 ft. above sea level—is one of the recent accomplishments in South Australia. This conduit supplies water to the industrial center of Whyalla, the location of the Island Continent's iron and steel monopoly. Steel pipe with welded joints and lined with cement mortar was used for the entire distance. Four main pumping plants and several storage reservoirs were included.*

AUSTRALIA'S iron and steel monopoly, Great Broken Hill Pty. Ltd., choose a sunbaked, waterless desert stretch along the coast of South Australia as site for the Island Continent's mightiest wartime arsenals. Relative security from enemy attack was one reason. Proximity of the Big Iron Knob ore deposits was another. The third was that shipbuilding, one of the industry's projected activities, is an outdoor industry that demands clear weather for its operations.

Yet, by all rules of industrial location the steel town of Whyalla was doomed to failure because industry cannot exist without water. For years a meager supply to fill a 100,000 gal. reservoir was eked out from distilled sea water and fresh water brought across Spencer's Gulf in barges.

That shipyards in the desert town of Whyalla are resounding to the thud of hammers and the rattle of riveters today is due to a spectacular pipeline project, carried out with secrecy during the war. If there is a shortage today in Whyalla, it is not of water but of manpower, housing and equipment.

The pipeline starts at the south bend of the Murray River at Morgan and extends northwestward through rough country to Port Augusta. From this point it runs southward to Whyalla. It is designed to deliver annually 1.2 billion gal. of water to Whyalla, 223 mi. away and 9 billion gal. to consumers along the supply line.

The steel pipe is laid above ground. It varies from 30 in. dia. at the intake to 21 in. dia. at Whyalla.

Water is drawn from the Murray River at Morgan and is elevated by four pumping lifts to a height of 1,558 ft. at Hanson where it is stored in reservoirs. From this point it flows by gravity to Whyalla.

The main is carried on concrete chairs placed 15 ft. apart. Concrete thrust blocks are provided at 270 ft. intervals on straight runs and at all bends. Alignment of pipe is maintained by these supports and massive concrete blocks spaced a mile apart.

The anchors are sufficiently heavy and rigid to overcome temperature effects of expansion and contraction. Nevertheless, temperature changes limit lengths of pipe that can be welded without undue movement. In construction, ten joints per mile were left for subsequent linking during periods of 65-70 deg. F. temperature. By this means compressive and tensile stresses in the steel were balanced.

Valves were installed at maximum intervals of two miles along the main. Service connections were provided along the entire route.

Creeks and ravines necessitated

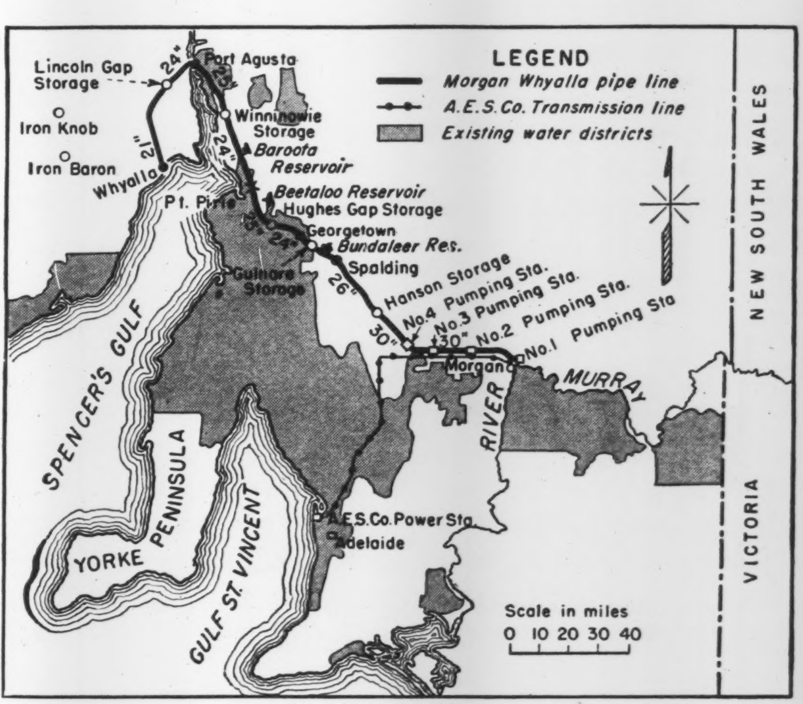

LEGEND
Morgan Whyalla pipe line
A.E.S.Co. Transmission line
Existing water districts
Lincoln Gap Storage
24"
Port Augusta
Iron Knob
Iron Baron
Winninowie Storage
Baroota Reservoir
21"
Whyalla
24"
Pt. Pirie
Beetaloo Reservoir
Hughes Gap Storage
Georgetown
24"
Bundaleer Res.
Spalding
26"
Gulnare Storage
Hanson Storage
No.4 Pumping Sta.
No.3 Pumping Sta.
No.2 Pumping Sta.
No.1 Pumping Sta
30"
30"
Morgan
MURRAY RIVER
SPENCER'S GULF
YORKE PENINSULA
GULF ST. VINCENT
A.E.S.Co. Power Sta.
Adelaide
NEW SOUTH WALES
VICTORIA
Scale in miles
0 10 20 30 40

Fig. 1. Starting at the south bend in the Murray River, the water supply line runs northwest to Port Augusta. Then, it crosses Spencer's Gulf and extends southward to the industrial center of Whyalla.

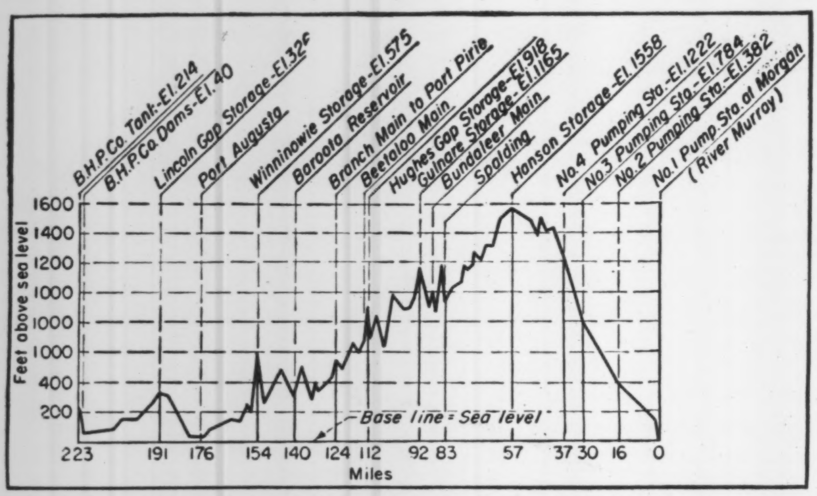


Fig. 2. By means of four pumping stations water is raised 1,558 ft. in 57 miles to tanks at Hanson. From this point gravity flow is maintained.

construction of numerous bridges and concrete piers. Spans vary in length from 30 to 140 ft. Over the Rocky River near Georgetown two 140-ft. steel trusses were required. Use of steel forms for concrete piers saved considerable in labor costs. These forms were used again and again. Tractor cranes were used for the handling of the pipes.

Joints were welded

For the most part the joints were made with oxy-acetylene welds. This method was selected for three reasons: successful adaptability to irregular joint clearances, availability of trained personnel from the recently-completed Tod River trunk main project and availability of ample equipment.

Electric-welded joints were used on a one-mile section. Cost records indicated small savings. However, a shortage of this type of equipment precluded use of electric-welded connections.

With semi-automatic butt welding an average of 46.7 ft. of seam was completed per welder per day. With hand butt welding the production amounted to 35 ft. per man-day. This performance was measured on 24-in. pipes with $\frac{1}{4}$-in. plate thickness. The average number of joints completed per man-day was seven with semi-automatic machine and 5.25 by hand. In addition to welding, the operators were required to do a certain amount of lining up and preparing joints. Also, some time was lost in moving equipment.

Costs were: $3.70 per joint or $0.55 per ft. of weld by the semi-automatic method, and $4.97 per joint or $0.75 per ft. of weld for hand-made welds. These figures include labor, power, materials, loss of time, overhead and all miscellaneous charges.

Welding operators were trained by the department after selection for physical fitness and intelligence. After a few weeks' practice on discarded pipes under the supervision of experienced welders and instruction in the maintenance of equipment, trainees were put on the job as welders' assistants. Within two to three months they were classified as second-class welders. Those whose progress continued to be satisfactory were, after twelve months, made first class welders. Proficiency was generally attained first in semi-automatic welding, then in butt welding. The highest degree of skill was required for fillet welds on $\frac{1}{2}$-in. sleeves that were placed on the main for pipeline closure under mean temperature conditions.

For steel pipes lined with cement mortar, the lining was terminated about $\frac{1}{2}$-in. from the end of the pipe. The gap was filled with mortar after pipes had been joined by welding. No damage to the interior coating was noted although heat of welding tends to loosen mortar too close to joints.

All branches and fittings were welded electrically to minimize lining destruction. Slip-in and bell-and-spigot joints that require fillet welds directly opposite the coating were also formed electrically.

All joints have given satisfactory service. Little trouble has been experienced with the welds. A few short cracks appeared, usually during the first winter after completion of the work. On two occasions a weld failed.

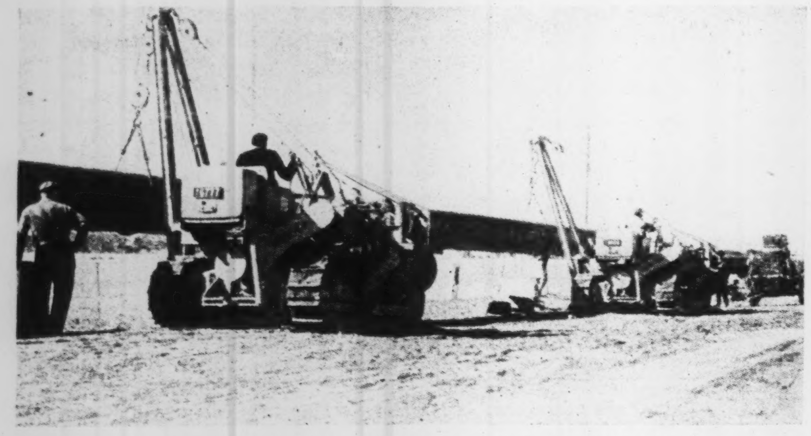


Fig. 3. Tractor cranes lift a 90-ft. length of pipe weighing 7½ tons into position.

Fig. 4. Some joints were hand-welded.

Troubles of this nature have occurred in sections which have been "linked in," *i.e.*, final closing of joints made at a fairly high temperature. This resulted in excessive tension when pipes contracted under winter conditions. Loss of water has been negligible, amounting to only a fraction of the loss encountered in lead-jointed mains.

Joints tests made

Tests were made frequently of pipe welds. Pieces 16-in. long and 2-in. wide were cut from joints for this purpose. These were machined and tested in tension. Results were tabulated and used to check work of the welders. Distinctive marks stamped near each joint identified the maker.

A small hydraulic testing machine was used to carry out field tests on strips. The opening left by the removal of the test strip was covered by a plate welded to the pipe.

Other features of the project include: four large, air-conditioned pumping stations, several storage reservoirs with a total capacity of 44 mg., use of 40,000 tons of steel, and placement of 75,000 cu. yds. of concrete.

The principle pumping plant is located at Morgan. Two 400 hp. units —the largest ever built in Australia— have a total capacity of 4,500 gpm. Two additional 800 hp. pumps will soon increase the flow to 7,200 gpm.

Power is brought from Adelaide by means of a specially-built 66,000-v. transmission line. A 525-hp. diesel generator supplies emergency electricity.

Planning, design and construction were carried out by the South Australia Engineering and Water Supply Department.

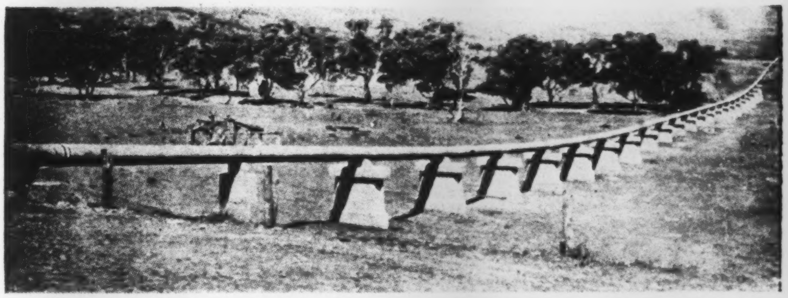


Fig. 5. Concrete piers carry the pipe line across the Back Creek Gorge.

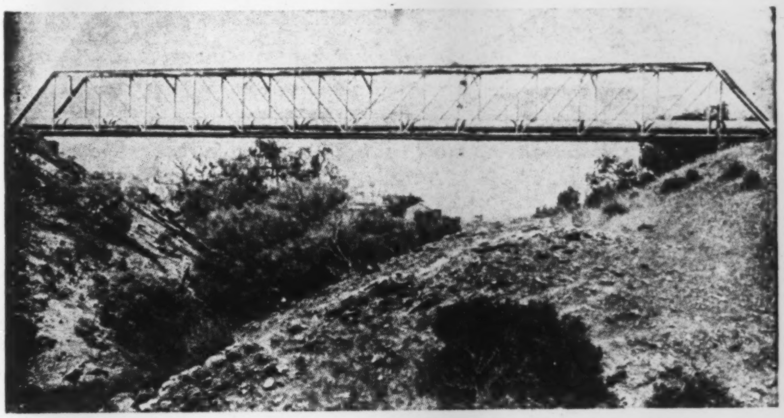


Fig. 6. The pipe line is carried over deep creeks on light truss bridges.

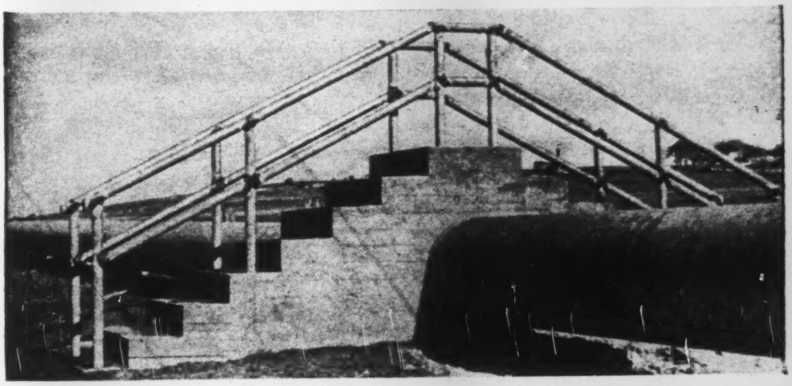


Fig. 7. Anchor blocks with "stepped" surfaces form ideal pedestrian crossings.

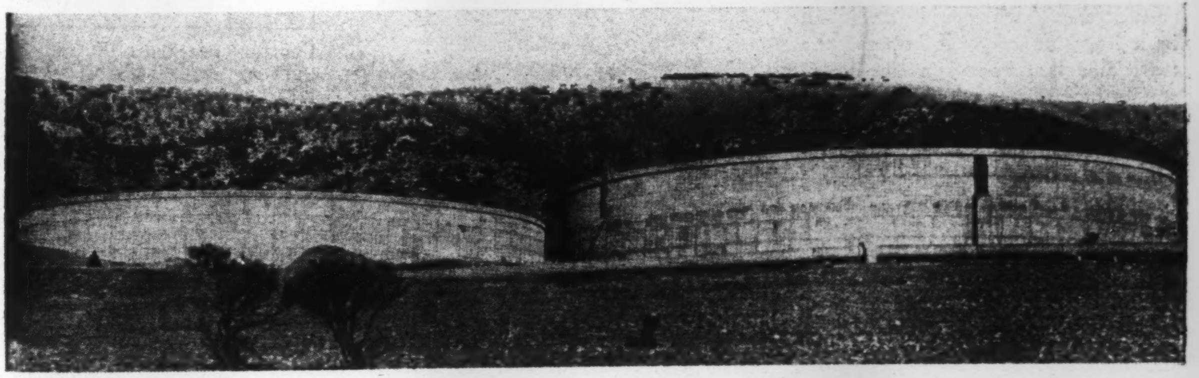


Fig. 8. Two reinforced concrete tanks of 2 mg. capacity at Winninowie provide storage for the city of Port Augusta.

Joint Leakage Stopped at Marshall Ford

Walter B. Bierce
Engineer-in-charge, Marshall Ford Dam

***Contents in Brief**—Maintenance of Marshall Ford Dam has required repair and drainage of the longitudinal joint created by constructing the dam in two stages. This work has included the use of a special filler compound to seal the top of the joint and the installation of a series of drainage holes connecting the joint and the operating galleries of the dam. To keep the main galleries in the dam dry, and thus eliminate major difficulties from condensation, a dehumidifying plant has been installed to reduce the moisture in the incoming air.*

PROPERLY TO MAINTAIN Marshall Ford Dam engineers of the U. S. Bureau of Reclamation had to find an improved method of draining and reducing the flow into the longitudinal joint created by constructing the dam in two stages. Measures also had to be taken to reduce the moisture content of the air in the galleries of the structure, thereby halting corrosion.

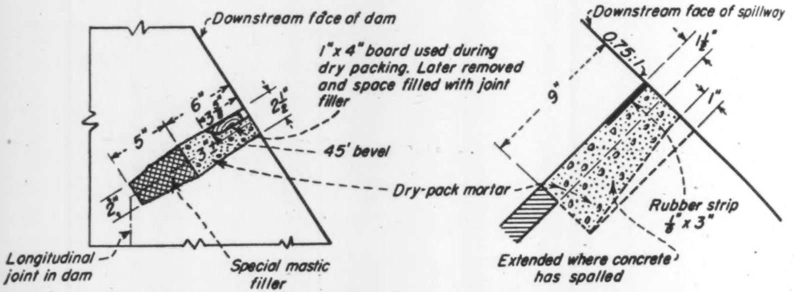
Marshall Ford Dam, located on the Colorado River 20 miles northwest of Austin, Tex., is the fifth largest masonry dam in the world. Key feature of the Colorado River Project, the structure, completed in 1941, is 270 ft. high, has a crest length of 2,325 ft., and contains approximately 2,000,000 cu. yd. of concrete.

Leakage into longitudinal joint

The dam was built in two stages; first, a low structure which was later transformed into a high dam by keying to its upstream face a new concrete section. This procedure resulted in a longitudinal joint between the two dams that opens on the downstream face. Grout stops were placed in this joint and it was grouted along with the other joints. However, considerable water entered through this joint and created a major maintenance problem.

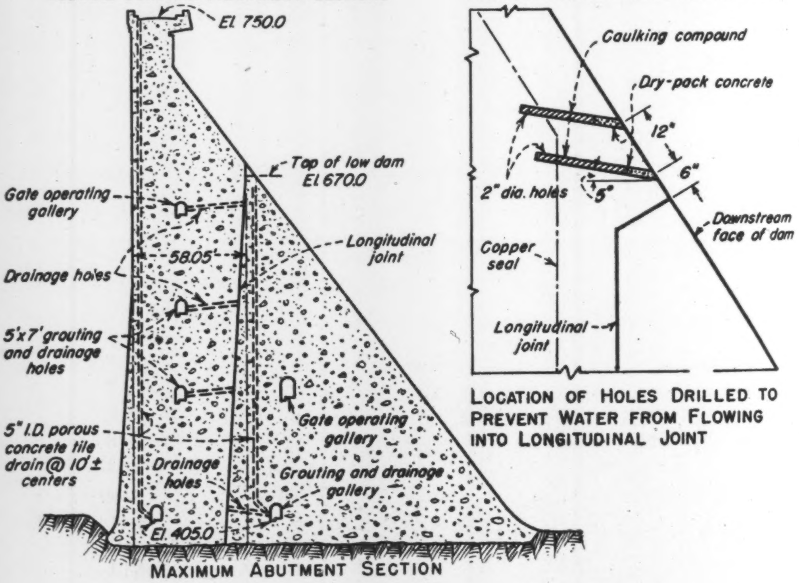
The general scheme followed in repairing the longitudinal joint where it appears on the downstream face of the dam is illustrated in Fig. 1. In the abutment sections, where only rainfall falling on the downstream face of the dam had to be kept out, the work consisted of cleaning out, keying and deepening the existing slot and then sealing it with a specially designed mastic joint filler and dry-pack mortar.

On a dry-weight basis the mastic filler was made up of 45 percent dry pulverized asphalt, 35 percent liquid


Downstream face of dam
1"x 4" board used during dry packing. Later removed and space filled with joint filler
6"
2½"
5"
45° bevel
Dry-pack mortar
Longitudinal joint in dam
Special mastic filler
Downstream face of spillway
0.75:1
1½"
9"
1"
Rubber strip ⅛"x 3"
Extended where concrete has spalled

DETAIL OF REPAIR AT TOP OF LONGITUDINAL JOINT IN ABUTMENT SECTIONS

DETAIL OF REPAIR AT TOP OF LONGITUDINAL JOINT IN SPILLWAY SECTION


El. 750.0
Top of low dam El. 670.0
Gate operating gallery
Longitudinal joint
58.05
Drainage holes
5'x7' grouting and drainage holes
5" I.D. porous concrete tile drain @ 10'± centers
Drainage holes
Gate operating gallery
Grouting and drainage gallery
El. 405.0
Caulking compound
Dry-pack concrete
12"
6"
2" dia. holes
5°
Downstream face of dam
Copper seal
Longitudinal joint

MAXIMUM ABUTMENT SECTION

LOCATION OF HOLES DRILLED TO PREVENT WATER FROM FLOWING INTO LONGITUDINAL JOINT

Fig. 1. Where the longitudinal joint in the dam appears on the downstream face, it was enlarged and filled with mastic and dry-pack mortar in the abutment sections, and with dry-pack mortar and a rubber strip in the spillway section. Work was also required to prevent flow from the transverse joints into the longitudinal joint (lower detail). To drain the longitudinal joint, holes were drilled to connect the joint with the galleries of the dam.

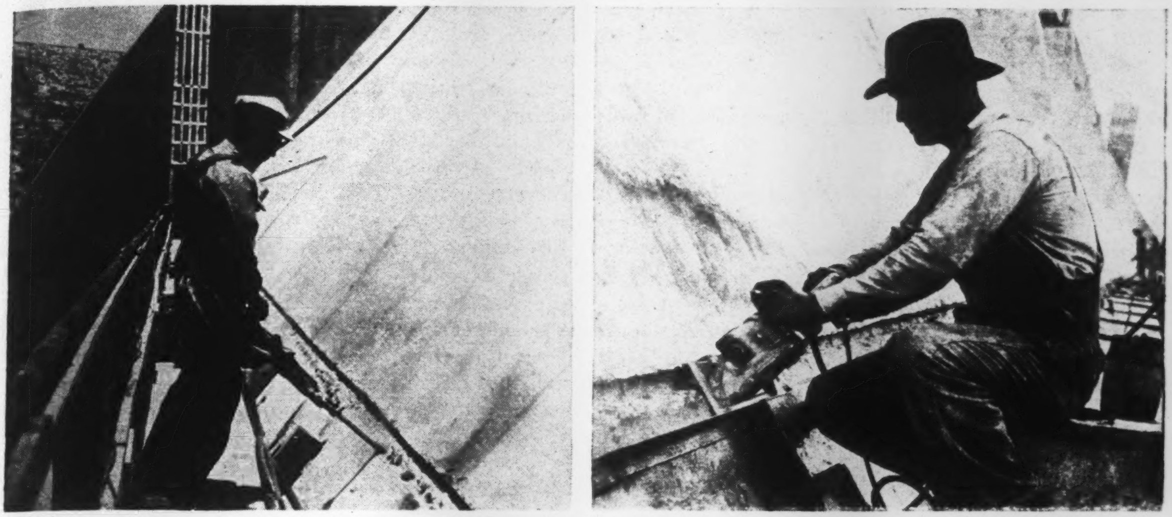


Fig. 2. To enlarge the longitudinal joint at the downstream face of the dam pneumatic drills were employed (left photo). Pneumatic saws equipped with $\frac{1}{8}$ x 8 in. carborundum wheels were also used to remove concrete in enlarging the longitudinal joint (right photo).

asphalt flux, 8 percent short-fibered asbestos, 4 percent diatomaceous earth and 8 percent plasticizer. The dry-pack mortar consisted of 1 part cement to 2 parts sand, sufficient water being added so that the mortar would become "jellied" when placed in 1-in. layers. A chipping gun was employed to compact the mortar in place. The special mastic filler used in repairing the longitudinal joint is expected, because of its adherence to concrete under the present condition, to keep all outside water from entering the joint in the abutment sections.

Rubber strip in spillway joint

Because the top of the longitudinal joint in the spillway section had to be sealed to keep out not only rain falling on the downstream surface of the dam, but also water flowing over the spillway crest, added care had to be used for the spillway section. The methods used for that portion of the dam are also shown by Fig. 1. The dry-pack mortar used for this length of the joint was of the same mix previously mentioned and it was compacted in the same manner. After enough mortar had been added to fill the excavated slot to within $3\frac{1}{4}$ in. of the face of the dam, the rubber strip shown in the drawing was put in place in the slot and the dry-packing completed. The dry-pack material was cured for 28 days under a continuous water spray.

The methods used to seal the joint have proved highly satisfactory. They have prevented practically all outside water from entering the joint.

To eliminate the possibility of hydrostatic pressure building up in the longitudinal joint at foundation level, 180 drainage holes were drilled from the grouting and operating galleries, which run parallel with the longitudinal joint, to intercept this joint as shown in Fig. 1. All of the holes are $2\frac{1}{8}$ in. in diameter and they are located on the center lines of the 49 blocks in the dam and 3 ft. 6 in. above the floor of the galleries. The holes were drilled with a jack-hammer and they were sloped upward at a 5-deg. angle. They have an average depth of 35 ft., their length varying because of the batter of the upstream face of the low dam.

It was considered possible that water running down the transverse joints outside each joint's copper seal, which is located 12 in. from the face of the dam and parallels it, could enter the longitudinal joint by passing behind the sealing material added at the top of this joint in the manner described. As a safeguard against such a flow two holes about 18 in. deep or sufficient to pass through the copper flashing were drilled from the downstream face of the dam into each of the 48 transverse joints, as shown in Fig. 1.

The first hole was drilled 6 in. above the joint and the second 12 in. higher. They were drilled with an air hammer equipped with a 2-in. dia. bit, and were sloped upward at an angle of 5 deg. from the horizontal. The holes were cleaned out with compressed air, packed for the first 14 in. with sash caulking compound and dry-packed with 1:2 sand-cement mortar for their remaining depth. Water traveling down the transverse joints cannot go beyond the material placed in the holes but it can escape through the joint to the face of the dam.

Dehumidifying plant installed

The two main galleries of Marshall Ford Dam, which are each 1,115 ft. long, contain the operating mechanism for the outlet gates. Since completion of the dam in 1941, these galleries have been wet from March to October. This condition occurred because the outside air entering the galleries during these months was relatively warm, and as the air circulated its temperature was lowered and much of its moisture was given up by condensation. The resulting moisture in the galleries caused leaching of the concrete, damage to the paint on the operating machinery (Fig. 4), and deterioration of the electrical control circuits for operating the outlet works.

To solve this problem the installation of a dehumidifying plant, which is believed to be the first operated in the galleries of a large dam, was decided upon (*ENR* June 15, 1944, vol. p. 876). Located in the right abutment, the plant has an air capacity of 9,000 cfm. and operates automatically. The incoming air is first cooled to 65 deg. F. to remove most of its moisture and then is passed through a multiple-step reheater, where its dry-bulb temperature is raised to 70 deg. F. After the air is circulated through the main galleries, it is discharged through two adit openings on the downstream face of the dam, one opening being located in the right abutment section and the other in the extreme left abutment section.

The dehumidification plant was placed in service Jan. 24, 1946, and its operation has been highly satisfactory, the galleries being continuously dry for their entire length. The resulting benefits are considered sufficient to have warranted an investment of several times the cost.

Gates become encrusted

Shortly after completion of the dam it was noticed that free calcium in the reservoir water adhered to the parts of both the paradox and ring-follower gates, all of which are 102 inches in diameter. At the end of two weeks the deposit could be easily wiped away, and after three weeks the calcium carbonate began to solidify but could be removed by washing under pressure. However, in six weeks' time the coating had to be removed by scraping or chipping.

Operation of the heavily enrusted paradox gates damaged moving parts, particularly the wedge rollers, chains and guides. To overcome this difficulty, engineers of the bureau improved the continuous chains of these gates by converting the existing cantilever links of the chains to the saddle type. Since this improvement was made operation of the paradox gates has given no further trouble. However, these gates are all operated on a 21-day schedule, as are the ring-follower gates, to prevent encrustation of their moving parts.

The work described was done under the supervision of the writer as engineer-in-charge at Marshall Ford Dam. The major portion of the work of repair work was done by forces of the Bureau of Reclamation, but a $5,625 contract for machining 2,500 paradox gate rollers was let to the Tips Engine Works, Austin, Tex. The dehumidifying plant was installed by C. H. Reubeck Co., San Antonio, Tex., at a cost of $7,680. Plant equipment was furnished by the government.

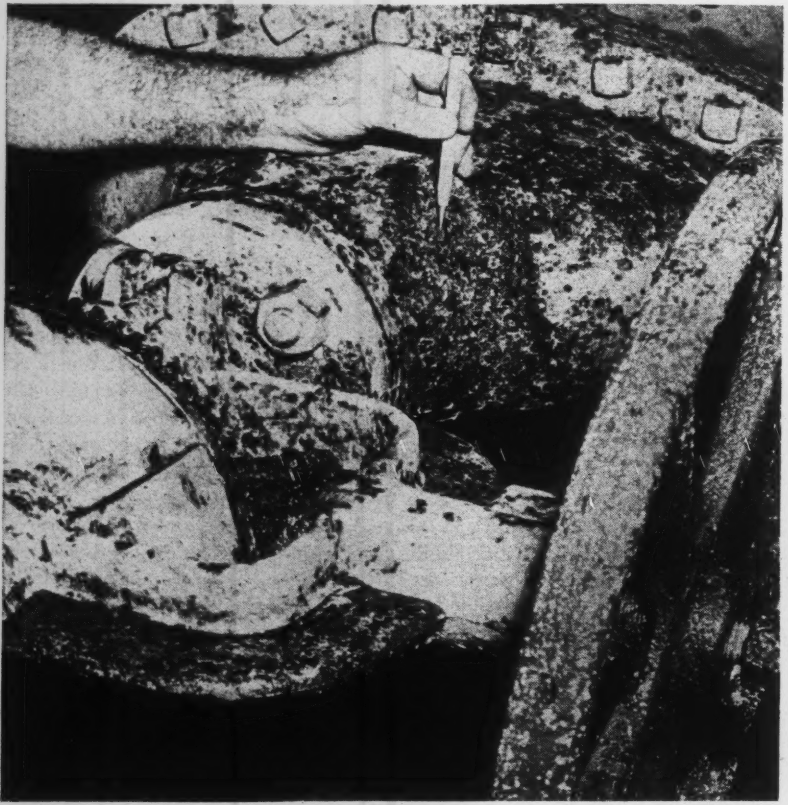


Fig. 3. The excessive condensation in the two main operating galleries, which resulted in severe rusting of the operating machinery, including this 16-in. air inlet valve of one of the ring-follower gates, was eliminated by installation of a dehumidifying plant to treat all air entering the galleries.

Diesel Engines in Tunnels

With properly maintained equipment and adequate ventilation of the workings, diesel-powered locomotives "will cause no undue contamination of the tunnel atmosphere," according to a detailed Bureau of Mines study of equipment used in the Delaware Aqueduct in New York in 1939-1941. This project, in August 1939, marked the first time in the United States that such locomotives had been used in tunnel construction.

In discussing the effect of the exhaust gases liberated by the locomotives on the tunnel air, the publication reveals that, "in no instance did the observed concentrations of carbon dioxide, carbon monoxide, or oxides of nitrogen in the general tunnel atmosphere exceed the limits generally considered permissible in the air of working places." However, the report also points out that diesel engines caused a noticeable odor which was considered objectionable by some employees.

Undesirable conditions were created on several occasions by the locomotives, but all such occurrences, the publication states, were traced to maladjustments or mechanical imperfections in the equipment, emphasizing the need for frequent inspection and careful maintenance of diesel equipment in underground service.

An appendix illustrating the graphic method for estimating ventilation requirements is included in the publication.

Copies of Report of Investigations 4032, "Diesel Engines Underground, VI.—Use of Diesel Locomotives in Construction of The Delaware Aqueduct: Effect of Exhaust Gases Upon the Quality of Tunnel Air" by L. B. Berger, M. A. Elliott, John C. Holtz, and H. H. Schrenk may be obtained by writing the Bureau of Mines, Department of the Interior, Washington 25, D. C.

Tests of Eccentric Split-Ring Joints Yield Rational Design Formula

R. H. Gloss
Structural Engineer, Timber Engineering Co.
Washington, D. C.

Contents in Brief*—Tests assimilating conditions in eccentric split-ring joints indicate that ultimate load varies almost directly with the thickness and effective depth of the critical member. An empirical formula that best explains the test results is the usual horizontal-shear formula modified by substituting the effective depth, as defined in the article, for the normal depth and allowing 150 percent of the tabulated horizontal shear stresses.*

DURING THE WAR, when thousands of timber buildings were under construction, the question was raised as to the method of determining the strength of wood members to which loads were applied eccentrically through mechanical fastenings. Several procedures were advanced, based on one of two ideas: Either the deciding factor was the tensile strength of wood perpendicular to grain or a solution was to be found in the shear formula applied to notched beams that have a gradual change in cross section. Without regard to what the vital factor was, The Timber Engineering Co. embarked on a program of 54 tests to investigate the performance of moment-resisting timber joints in which split-ring timber connectors are used to transfer load.

Joint A (Fig. 1) represents a typical eccentric joint for which a proposed method of design was sought. It is important to note that the empirical formula developed from the results of these tests does not apply to concentric joints. Present recommendations for concentric joints are based on extensive tests and are considered adequate.

The information developed in the tests indicates that in designing eccentric or moment-resisting joints using split-ring connectors, the following procedure is conservative:

1. Design the members and the connections as though the joint were concentric. 2. Place connectors in the critical piece so that maximum possible effective depth (d_e), as defined later, is realized. 3. Check critical member for fiber stress in bending or in combination with direct axial stress, when present. 4. Check critical member for horizontal shear, substituting the effective depth (d_e) for the normal depth (h) in the horizontal shear formula, and allow 150 percent of the tabulated allowable horizontal-shear values. The formula then becomes:

$$\frac{3V}{2bd_e} = 1.5H$$

in which V = total vertical shear; b = breadth of section; d_e = effective depth of section or distance from the inside edge of the split ring nearest the unloaded edge of the member to the loaded edge (Fig. 2); and H = tabulated allowable unit stress in horizontal shear. 5. If horizontal shear values are excessive, change detail to increase effective depth or effective area until stresses are satisfactory. Designers familiar with actual conditions may be justified in allowing more than 150 percent of the shear values.

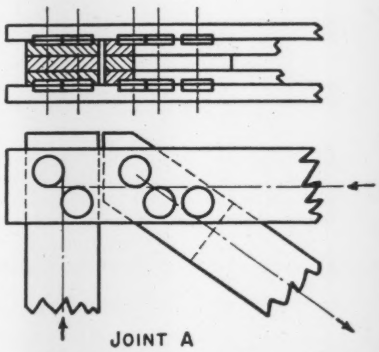
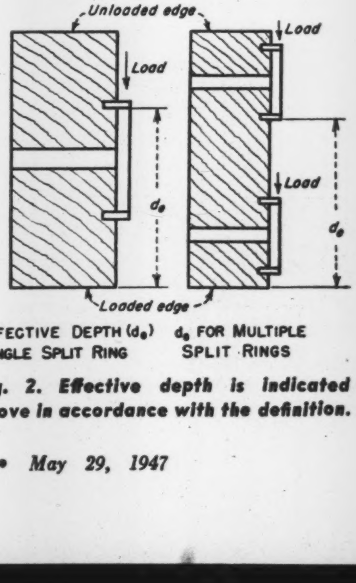


Fig. 1. Typical eccentric joint using split rings for which design data was sought.



EFFECTIVE DEPTH (d_e) SINGLE SPLIT RING

d_e FOR MULTIPLE SPLIT RINGS

Fig. 2. Effective depth is indicated above in accordance with the definition.

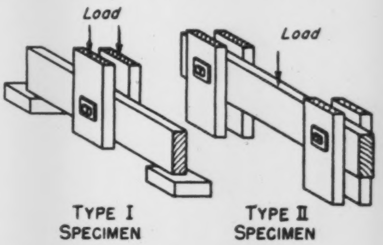


Fig. 3. Test specimens of the above two types were loaded to failure. Type II withstood greater loads.

Method of testing

To obtain this conclusion, test specimens of two types, as shown in Fig. 3, were fabricated from structural stress-grade (non-dense) Douglas fir, and horizontal members, 1½, 2, and 2½ in. thick, in widths up to 11 in., were tested to failure in a hydraulic testing machine. Outside double members in all cases were 2 x 6 in. Connectors between outside boards and the center horizontal member were 2½- and 4-in. diameter, standard (single-bevel) split rings, with ½- and ¾-in. machine bolts, respectively. Variables of the tests were: Type of specimen, total depth (h) and thickness (b) of center member, effective depth (d_e), connector size, and number of connectors (Type I specimens only).

In all cases, failure occurred in the center member, which was subjected to bending and shear stresses assimilating conditions in an eccentric joint. The failure appeared primarily as a longitudinal split in the horizontal board. Actual initial failure might be attributed to bending stress, tension perpendicular to the grain, horizontal shear, or some combination of the three. Since it was impossible to determine precisely which of the three constituted initial failure, test data were analyzed to determine a relationship between ultimate load and the variables of the tests.

It was found that ultimate load varied almost directly as the effective area (effective depth × thickness of center member). No apparent significant relationship existed between ultimate load and any of the other variables of the tests.

In Fig. 4 is illustrated the relationship between effective depth and ultimate load for the three thicknesses of members tested. If the results were perfectly in accord with the theory, the line for the 2-in. material would fall midway between the lines for the 1½- and 2½-in.

Consistently higher values were obtained with Type II specimens than with Type I. This may have been due in part to the fact that, in Type II, stressed fibers at the critical section are adjacent to unstressed fibers and thus are given additional support, whereas, with Type I specimens, adjacent fibers at the critical section are equally stressed and thus lend no support to each other.

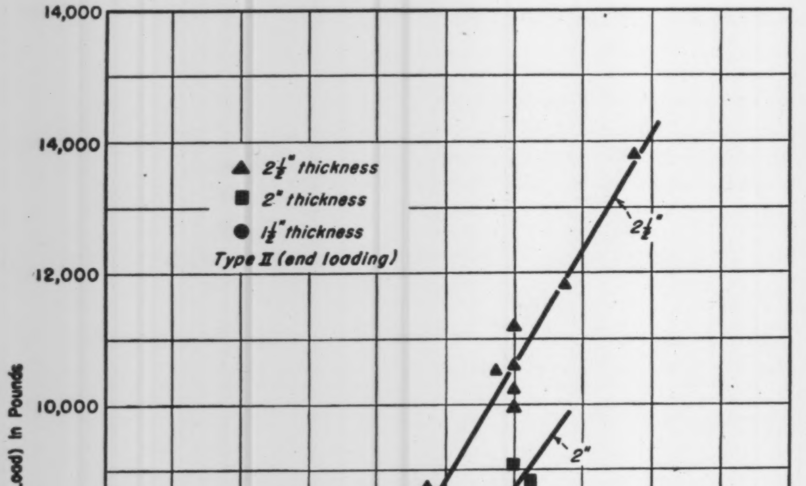


Fig. 4. Plotted test results indicate that ultimate load varies almost directly with effective depth for the three thicknesses tested.

Proposed design conservative

Suggested design values as shown on the charts are conservative even when compared with Type I specimen results. Actual conditions in most eccentric joints are more like those in Type II specimens, in that significant shear exists in the member in only one direction from the joint. Furthermore, eccentricities are usually kept as small as possible and some direct transfer of shear stress may be realized.

It is important to bear in mind that these data and charts include both 2½- and 4-in. diameter split rings. The failures are independent of the number or size of split rings, but depend upon the location of the connectors in the joint.

The resulting recommendations do not affect the design of the connectors, but do control the placement of the connectors and the design of the critical member. As an example, a 2½-in. split-ring joint might carry twice the load of a 4-in. split ring joint, where normally just the opposite would be expected. The reason would be that the allowable load on the 4-in. split-ring joint might be reduced considerably as the result of an analysis based on these tests.

Acknowledgements

Conducted at the Wood Product Development Shop of the Timber Engineering Co. at Washington, D. C., the test program was conceived by E. S. Lank, under whose supervision the tests were made with the assistance of E. J. Tan. Data analysis and report preparation were performed by Mr. Lank and the writer.

Comment and Discussions

Readers' opinions on matters that concern engineers and contractors

Home Made Soils Equipment

Sir: The old technique of building highways in Central America, by using empirical formulas in design and hand labor in construction work, belongs to the past. Actually, these Central American countries are applying new and modern methods for road and airfield construction. Bulldozers, scrapers, motor graders, paving mixers, etc., are used nowadays. This technical improvement is largely due to the effectiveness of the Good Neighbor policy started several years ago, which has contributed, a great deal, to bring the engineers of this hemisphere in closer and closer contact.

Since modern highway and airport construction requires a proper control of materials, most of the Central American highway departments have encouraged the organization of their materials and soils laboratories. In Nicaragua, where the Inter-American Highway is being built under the supervision of the Public Roads Administration, I was engaged to organize the materials laboratory and to train the personnel in the various test procedures.

After a year's work, we set up a fairly complete laboratory where most of the tests on soils, cement, aggregates, and concrete, can be performed. Part of the equipment had to be imported, but due to the lack of transportation facilities, quite a few pieces of apparatus were designed by the author and built in the Nicaraguan highway department shops, by local mechanics. Although these mechanics were not familiar with this type of equipment, the results obtained were very satisfactory, as could be appreciated in the accompanying photographs.

Fig. 1 shows the Los Angeles abrasion machine and the home-made mechanical sieve shaker. The shaker, which was designed to shake four sets of sieves, if necessary, is made of wood, and could be operated either independently or at the same time with the rattler.

Miscellaneous equipment for testing cement, concrete, and aggregates, such as the Vicat needle, cylindrical molds for concrete specimens, metal containers for unit weight determination of aggregates, conical molds for slump tests, etc., are shown in Fig. 2. The device shown in this picture for checking compaction in the field, by means of the sand displacement

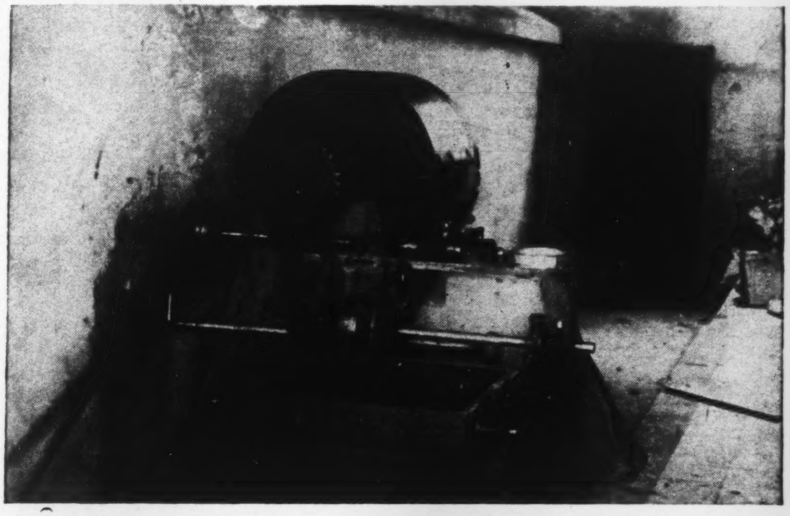


Fig. 1. Home-made Los Angeles rattler machine and sieve shaker in the Managua laboratory. The curing room in the background has a metallic door.

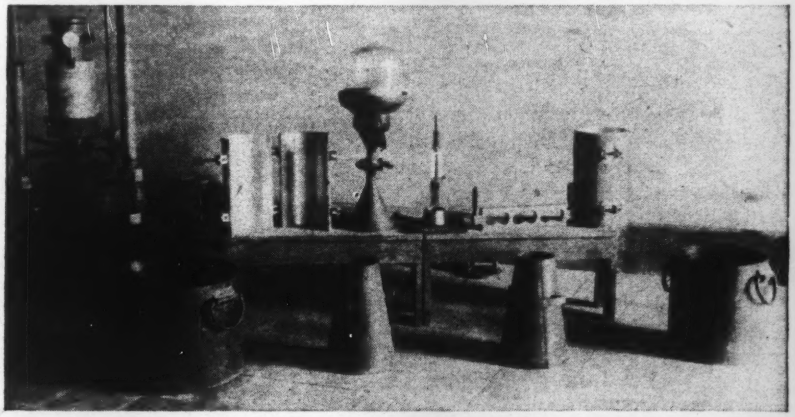


Fig. 2. Miscellaneous equipment built in the shops of the Nicaraguan Highway Department for testing cement, concrete and aggregates and for checking compaction in the field.

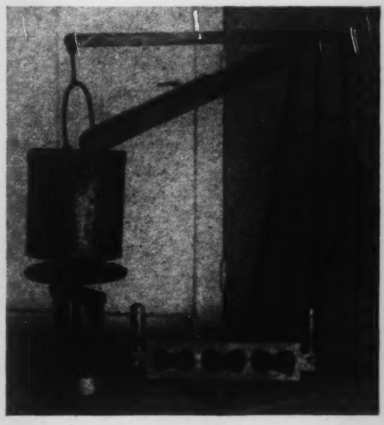


Fig. 3. Briquet molds and the briquet testing machine, made locally, will register up to 450 psi.

method, was made by using an old thermos jar.

Fig. 3 shows a home-made briquet testing machine with the corresponding briquet mold. The support below the container, which can be moved by means of a screw, is used to avoid sudden drops when the load is applied.

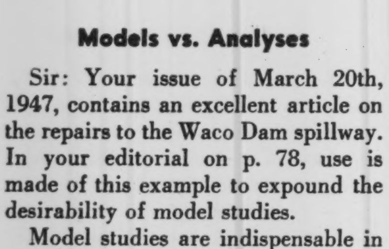
RAUL VALLE R.
Civil Engineer,
Managua, Nicaragua

Models vs. Analyses

Sir: Your issue of March 20th, 1947, contains an excellent article on the repairs to the Waco Dam spillway. In your editorial on p. 78, use is made of this example to expound the desirability of model studies.

Model studies are indispensable in performing their function in hydraulic design. Generally, their function should be to check the performance of hydraulic studies which cannot be designed by analytical methods. There is an increasing tendency to carry out model tests on structures which can be analyzed with ease.

A simple analysis of the Waco Dam spillway section (Fig. 3 in the article) yields the tailwater-rating curve (shown below) required for jump formation. This analysis assumes that all gates are open. With abrupt transition from dam to apron, a relatively small increase in tailwater above the required amount will result in drowning the jump, and the high-velocity stream will persist beyond the apron. Also, with the short apron, a drop of only 0.7 ft. in tailwater below the required amount at peak discharge would sweep the jump off the apron. At lower discharges, the drop is even less. There is no margin to allow for discrepancies between actual and required tailwater, or to allow for operation of only a few gates at a time.



These conclusions can be reached by an expenditure of two or three man-hours of labor. The most expensive model study could do no better. It would, of course, give equally good results.

It may be argued that a model study gives a useful check on a theoretical analysis. This is true in many structures. However, differences between theoretical and actual performance will not be shown up by a model study. Such differences are often caused by high velocity effects in the prototype which are not reproduced in the model.

The point in your editorial was well taken, if the example used had illustrated the necessity for a model study. The writer merely wishes to make an additional point, which is that model studies are only necessary in cases where analytical methods can not be applied.

J. S. KENDRICK
District Engineer
Department of Lands
The Province of British Columbia
Victoria, B. C.

Housing on Landfill Sites

Sir: Prof. Rolf Eliassen's description (*ENR* May 1, vol. p. 756) of the odor control during the early part of the construction work at the Rego Park emergency housing project in New York City may lead to some incorrect generalities concerning the use of sanitary landfills. Of the nine areas within the city limits approved for emergency housing in the joint venture of the Federal Public Housing Authority and the New York City Housing Authority, the two Jamaica Bay areas and Rego Park are sanitary landfills. Ulmer Park, part of the Bruckner area, Linden and most of the Holmes Airport (Northern Boulevard) sites are filled-in ground, mostly ashes and construction rubbish. A general description of the project sizes and the types of foundations developed for the various types of ground appeared in *Construction Methods*, Nov. 1946, p. 92. A newsstory on the first project (now in use about a year) at Canarsie Beach Park, now known as Jamaica Bay West, appeared in *ENR*, Mar. 14, 1946, vol. p. 380.

The writer's firm was engaged by F.P.H.A. to advise as to the suitability of the suggested sites and to design adequate foundations for the sites accepted. Several suggested sites were rejected as not sufficiently consolidated or because of lack of cover on "raw" fills. The general recommendation for the use of sanitary landfill areas was to leave the existing soil cover undisturbed and to make up changes in grade and contour by adding materials to the low areas. Trenching for utilities was of course necessary and the recommendation for the use of the Rego Park area included the statement:

> "Since it is quite certain that sanitary fill will be exposed in the trenching for pipes on a large portion of this development, and the material removed may be offensive, it will be necessary to bring in sand fill from outside areas to cover exposures resulting from such trenching."

At the Jamaica Bay projects, there was surprisingly little complaint of offensive odors during construction, and practically no comment on this subject was heard during interviews with residents of the completed areas during mid-summer. A minimum of surface disturbance and a thin covering of top soil did the trick.

At the Rego Park area, a major garbage moving operation was performed by the site contractor with no justification from the point of view of "the economic standpoint to alter the drainage characteristics of the surface of the landfill area and thus change the slopes of the land." Actually, the offensive material was exposed and also spread over areas where the sand cover was not removed. Complaints of this disregard of recommendations remained unheeded until local citizen groups forced the city to stop the operation and cover all exposures, as well as the spray process so ably developed by Professor Eliassen. The entire area is covered in addition to the sand layer over the fills, with a 12-in. pad of rolled cinders under the buildings and roads or with a 6-in. layer of top soil in the seeded areas.

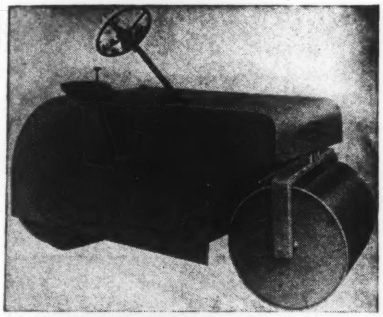
Before judgment is passed on the usability of sanitary landfills based on this example, comparison and inspection should be made of the use of similar areas where construction procedures were properly carried out to a satisfactory conclusion.

JACOB FELD
Feld and Timoney, Consulting Engineers,
New York, N. Y.

New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS

CONVEYOR BELT—New conveyor belt 250 to 400 percent stronger than previous rubber-fabric belts has been developed for conveying coal, iron ore, and other bulky materials over long distances. It is especially designed for use in mines, quarries and large dam construction projects. Key to its increased strength is revolutionary new textile construction of nylon and Ustex yarn that increases permissible working tension of each ply two and one-half times and permits use of more plies. New belt also has advantages of low stretch lengthwise and increased flexibility crosswise, which make it possible to build longer and heavier belt with minimum of stretch and excellent troughing qualities. It can be spliced easily and quickly.—*United States Rubber Co., Rockefeller Center, New York, N. Y.*



TANDEM ROLLER—A new tandem roller, Model 60, has plate and angle construction welded into an exceptionally rigid unit. A streamlined housing completely encloses all operating mechanism. It has a short wheel base that permits maneuvering in close quarters, and an automotive type steering gear. Internal expanding band frictions permit instant change in direction travel. The total weight is 4,840 lb. empty, and 7,200 lb. when filled with water.—*Clyde Iron Works, Inc., Duluth 1, Minn.*

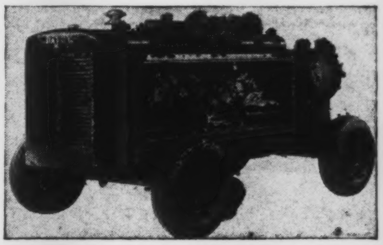
ELECTRODES—For direct-current reverse polarity welding only of low alloy cast steel or low alloy high tensile strength rolled steels in all positions, the new AP-MO electrode is available in three diameters from ⅛ to 3/16-in. For rapid and economical welding of mild steel in all positions the SW-2 electrode is available in four diameters from 3/16- to 5/16-in. Welds made with SW-2 have very desirable characteristics in respect to flat contours, side wall wash-up, freedom from undercutting, and extreme ease of slag removal.—*Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.*

TIMBER GRIP—The Oliver timber grip, a new device for use in laminated timber construction, provides a simple means of preventing opening up or splitting, and also for holding closed any timber already cracked or split. The grip consists of two interlocking steel members, inserted from opposite sides of a timber in a prebored hole. The grip will withstand a 5,000-lb. pull stress. For laminated construction, the grips are used as stitch bolts to hold separate timbers together. Available to fit timbers up to 12 in. wide.—*Oliver Iron and Steel Co., Pittsburgh 3, Pa.*

TRACTOR EXCAVATOR—The T6 Traxcavator is mounted on, and engineered as a unit with, the "Caterpillar" D6 tractor to make fullest use of its power and work capacity. Buckets of 1½ or 1¾ cu. yd. rated capacity are standard with the new T6; quarry, heavy duty and other buckets for special uses can also be supplied. A bulldozer blade, quickly interchangeable with the bucket, is also available. —*Trackson Co., Milwaukee 1, Wis.*

AUTOMATIC BLUEPRINTER—The new Revolute M4 utilizes the Revolute revolving contact principle for providing slip-free contact between the tracing and sensitized material; contact is achieved through the use of a Pyrex glass cylinder, the light source remaining stationary while the cylinder revolves. Other features of the blueprinter include a quartz lamp, high speed, simplified feeding, central controls double chemical applicator, thorough washing and drying.—*Paragon-Revolute Corp., 77 South Ave., Rochester 4, N. Y.*

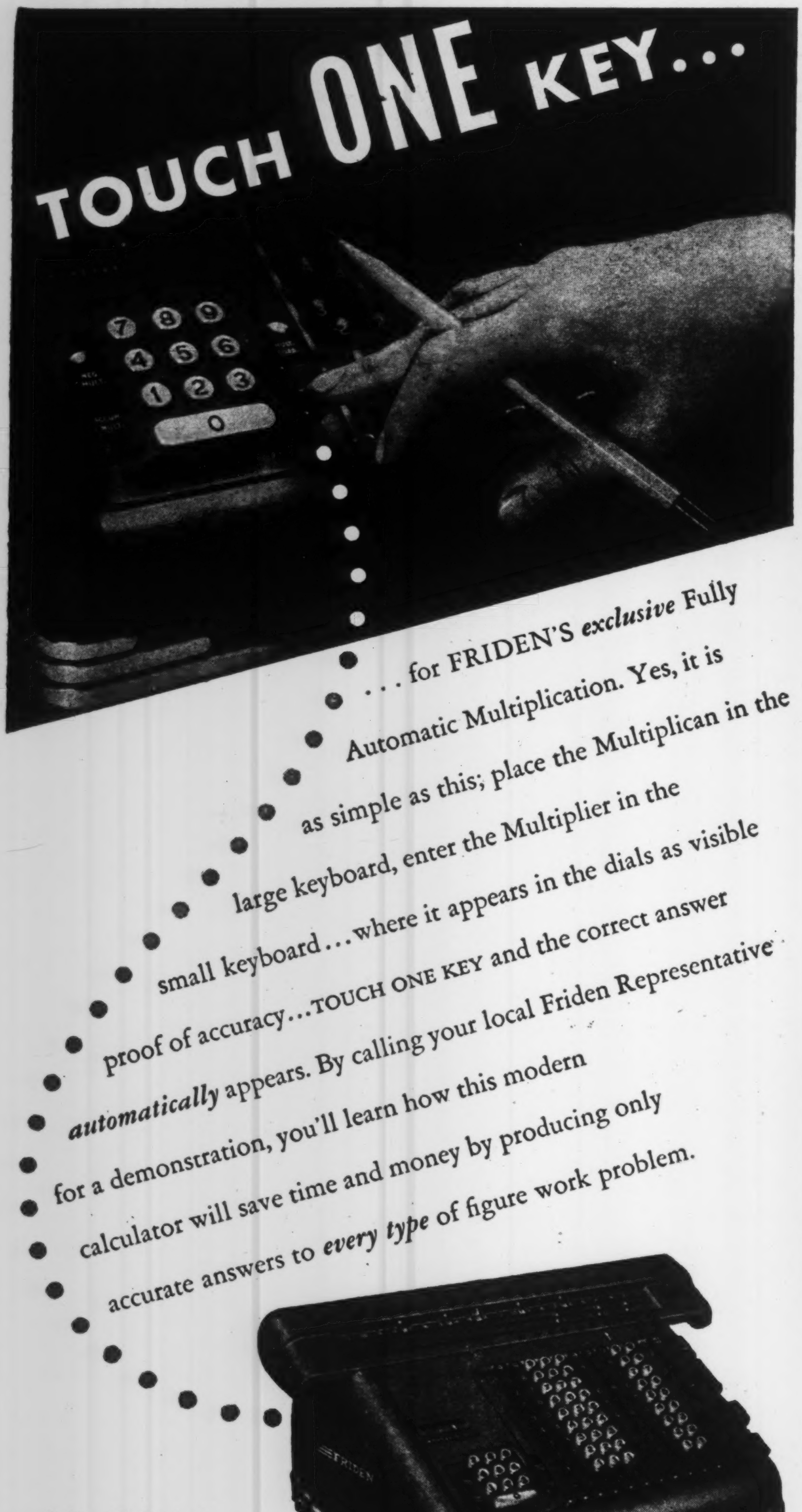
DOUBLE VAT KETTLE—The Heet-Master double vat kettle, Model 120-DVP, has been designed and produced for use with new rubber sealer compounds. This new unit uses a double boiler heating principle to provide uniform, thermostatically controlled, indirect heating that is absolutely essential before application of all rubberized asphalt joint sealing compounds.—*Aeroil Products Co., Park Ave., at 57th St., West New York, N. J.*



PORTABLE AIR COMPRESSOR — A V-type 160 cu.ft. portable air compressor, known as the Model 160 Air Chief, is available in standard skid, steel wheel trailer and pneumatic tired trailer mounting styles. Flanged wheel type units are also manufactured for railroad work. The unit is of double V-type design, with three low pressure cylinders and one high pressure cylinder. The V design permits substantial reductions in dimensions and weight.—*Davey Compressor Co., Kent, Ohio.*

POWER SAW—New 6-in. portable electric hand saw, known as Model 60 Mallsaw, weighs 8¾ lb. and its aluminum alloy die cast housings weigh less. Blade has cutting capacity up to 2 in. Motor turns blade at 3,000 rpm. at normal full load speed.—*Mall Tool Co., Chicago 19, Ill.*

INSULATION—Ferro-Therm steel insulation is a "reflective" insulation with all qualities of steel, permanent and fire-arresting. A tin-alloy coating makes it non-corrosive. Though only 0.006-in. thick, it acts as a temperature moderator all year round. It does not harbor



TOUCH ONE KEY...

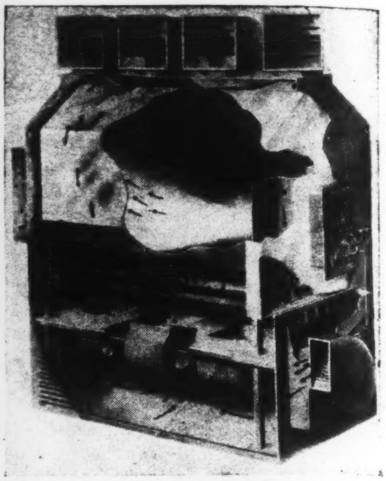
. . . for FRIDEN'S *exclusive* Fully Automatic Multiplication. Yes, it is as simple as this; place the Multiplican in the large keyboard, enter the Multiplier in the small keyboard . . . where it appears in the dials as visible proof of accuracy . . . TOUCH ONE KEY and the correct answer *automatically* appears. By calling your local Friden Representative for a demonstration, you'll learn how this modern calculator will save time and money by producing only accurate answers to ***every type*** of figure work problem.

Friden Mechanical and Instructional Service is available in approximately 250 Company Controlled Sales Agencies throughout the United States and Canada.

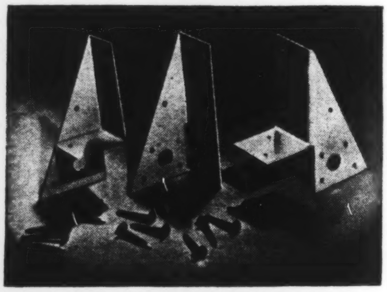
FRIDEN CALCULATING MACHINE CO., INC.

HOME OFFICE AND PLANT • SAN LEANDRO, CALIF., U. S. A. • SALES AND SERVICE THROUGHOUT THE WORLD

vermin, rodents, absorb moisture or odors of any kind. Stapled permanently in place, it cannot settle or pack down. —*American Flange & Manufacturing Co., 30 Rockefeller Plaza, New York, N. Y.*

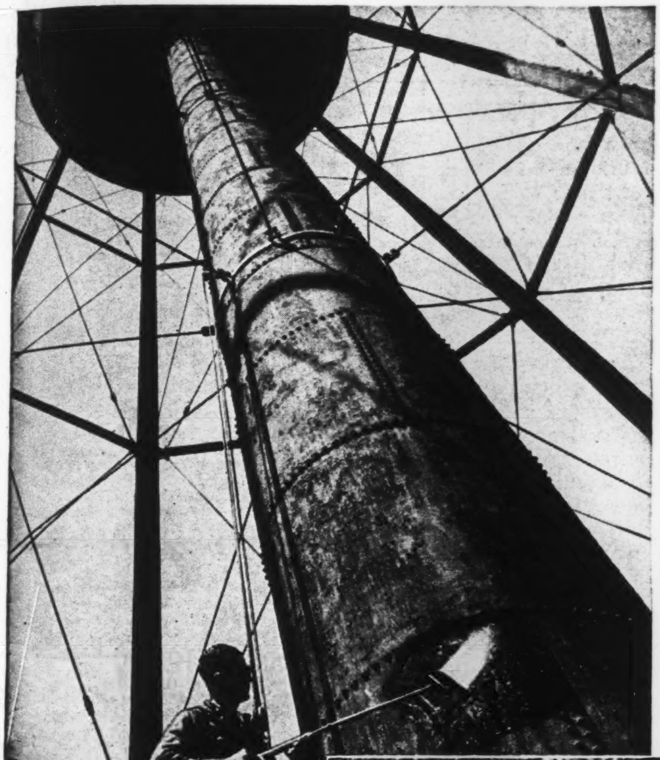


DIRECT-FIRED HEATERS—Development of a stainless steel combustion chamber for commercial and industrial direct fired Dravo heaters increases their life expectancy and eliminates refractory lining. Eight sizes have been developed, ranging from 400,000 to 2,000,000 Btu. per hour. All are of the same basic design and are completely equipped with modern safety devices. —*Dravo Corp., Pittsburgh, Pa.*



FRAMING ANCHOR—A new timber connector, known as a framing anchor, used in home and light construction to increase rigidity around window and door openings and as added strength in floor and wall framing is made of 18 gauge zinc coated, corrosion resistant sheet steel.

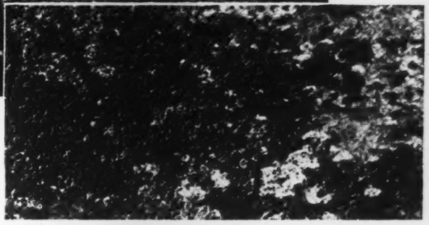
The anchors are joined to the wood with non-splitting full bodied nails that develop maximum shear, it is claimed, without splitting the lumber. Known as Trip-L-Grip framing anchors, the devices have been laboratory tested at Georgia Institute of Technology.—*Timber Engineering Co., 1319 18 St., Washington 6, D. C.*



Start of flame-cleaning operation on water tower structure

It's Flame Cleaning

the fast, economical method for Preparing Steel for Painting



BEFORE — *Close-up view shows conditions of paint-lift heavy rust and scale that were met.*

AFTER — *The finished job after flame cleaning. A smooth, clean, dry surface ready for a lasting coat of paint.*

QUICKLY, easily and safely applied, the Airco flame cleaning process provides a clean, warm and dry surface conducive to a lasting paint job. The oxyacetylene flame cockles old paint, loosens rust and drives off hidden moisture . . . gives longer paint life to all kinds of steel structures.

In planning new steel structures exposed to weather, prepare before you paint for economical maintenance. Flame clean all steel parts before applying the prime coat of protection. This method loosens the semi-tenacious mill scale. No dirt or moisture left to start corrosion. Reduces future maintenance costs to absolute minimum and gives longer life to the paint job.

For further details write for folder ADG-1066B—"Flame Cleaning and Dehydrating Old Steel Structures," and folder ADG-1067A—"Flame Cleaning and Dehydrating New Steel Structures." Address: Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas. Represented Internationally by Airco Export Corporation.

AIRCO

AIR REDUCTION

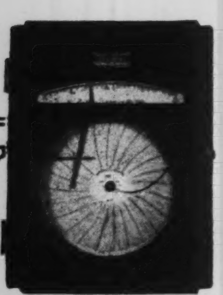
Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

ADVANTAGES OF OXYACETYLENE FLAME CLEANING

1. Provides a clean, warm and dry surface conducive to a lasting paint job.
2. Easily used inside the shop or in the field because of the extreme portability of the apparatus.
3. No special technical skill required.
4. Saves time and money in steel structure preparation.

AIR REDUCTION EN
60 East 42nd Street, New York 17, N. Y.
Please send me a copy of folder checked.
☐ *ADG-1066B—"Flame Cleaning and Dehydrating Old Steel Structures"*
☐ *ADG-1067A—"Flame Cleaning and Dehydrating New Steel Structures"*
Name________________
Firm________________
Address________________
City________ Zone______ State______



Builders
Flo-Watch
Meter

Flo-watch METER
WATCHES FLOW
Mechanically

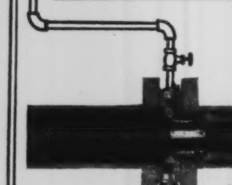
TOTALIZES • INDICATES • RECORDS

One **rugged** and **simple** mechanical instrument,— Builders Flo-Watch Meter — located on the control panel, provides complete flow information over distances up to 100 feet. The Flo-Watch Meter totalizes, indicates, and records all flow of liquid, air or gas over a range of from 10% to 100% of rated capacity.

Only two small pressure tubes are required to connect the Flo-Watch to any differential producer — Venturi Tube, Nozzle or Orifice. The Builders Venturi Insert Flow Nozzle shown with the Flo-Watch provides economical yet accurate metering . . . the Flo-Watch Instrument, actuated by changes in the mercury level in its U-tube wells, responds within 1% to variations in flow through the Nozzle. The Insert Nozzle is mounted between standard pipe flanges, with pressure piping connected to the mounting flange. It is unnecessary to drill the pipe-wall or flanges, which greatly simplifies correct installation.

For Bulletins 318B and 356, address
BUILDERS-PROVIDENCE, INC.
(Division of Builders Iron Foundry)
51 Codding St., Providence 1, R. I.

BUILDERS PRODUCTS
Venturi, Propeloflo and Orifice Meters
Venturi Filter Controllers and Gauges
Type M and Flo-Watch Instruments
Kennison Nozzles • Conveyoflo Meters
Manometers • Filter Operating Tables
Wheeler Filter Bottoms
Master Controllers
Chronoflo Telemeters



Builders Venturi
Insert Flow
Nozzle

BUILDERS-PROVIDENCE
Instruments

Men and Jobs

Claude B. Friday, a former employee of the bureau of bridges, New York State Department of Public Works, has been named the director of the bureau of aviation, New York State Department of Commerce. During the war Mr. Friday was a commander in the Navy's Civil Engineering Corps. He is a graduate of Rensselaer Polytechnic Institute, 1931.

Edmund T. Lynch, a bridge designer for New York State Department of Public Works, was recently appointed senior engineer in the bureau of aviation, New York State Department of Commerce. Formerly a major in the Corps of Engineers, he saw extensive service in the Pacific. He is a graduate of Rensselaer Polytechnic Institute, 1929.

J. J. Hessler has been named contracting manager in charge of American Bridge Co.'s Pittsburgh district office. He has been with the U. S. Steel subsidiary since 1929, beginning as a draftsman.

Paul S. Kingston resigned recently as city public health engineer in Rochester, Minn., to become executive engineer of maintenance and utilities at St. Mary's hospital in Rochester. He will direct development and application of engineering policies and procedures for the hospital with a chief engineer and a chief of maintenance on his staff.

Perry A. Wilson of the Niagara Falls, N. Y., bureau of engineering, has been appointed commandant of the newly-organized Civil Engineers Corps Reserve Unit 3-31.

John R. Peyton, principal civilian engineer of the U. S. district engineer's office for the Jacksonville, Fla., area has been made the executive officer to succeed Maj. Blase Nemeth. **A. H. Brown,** senior engineer, is the new chief of the operations division.

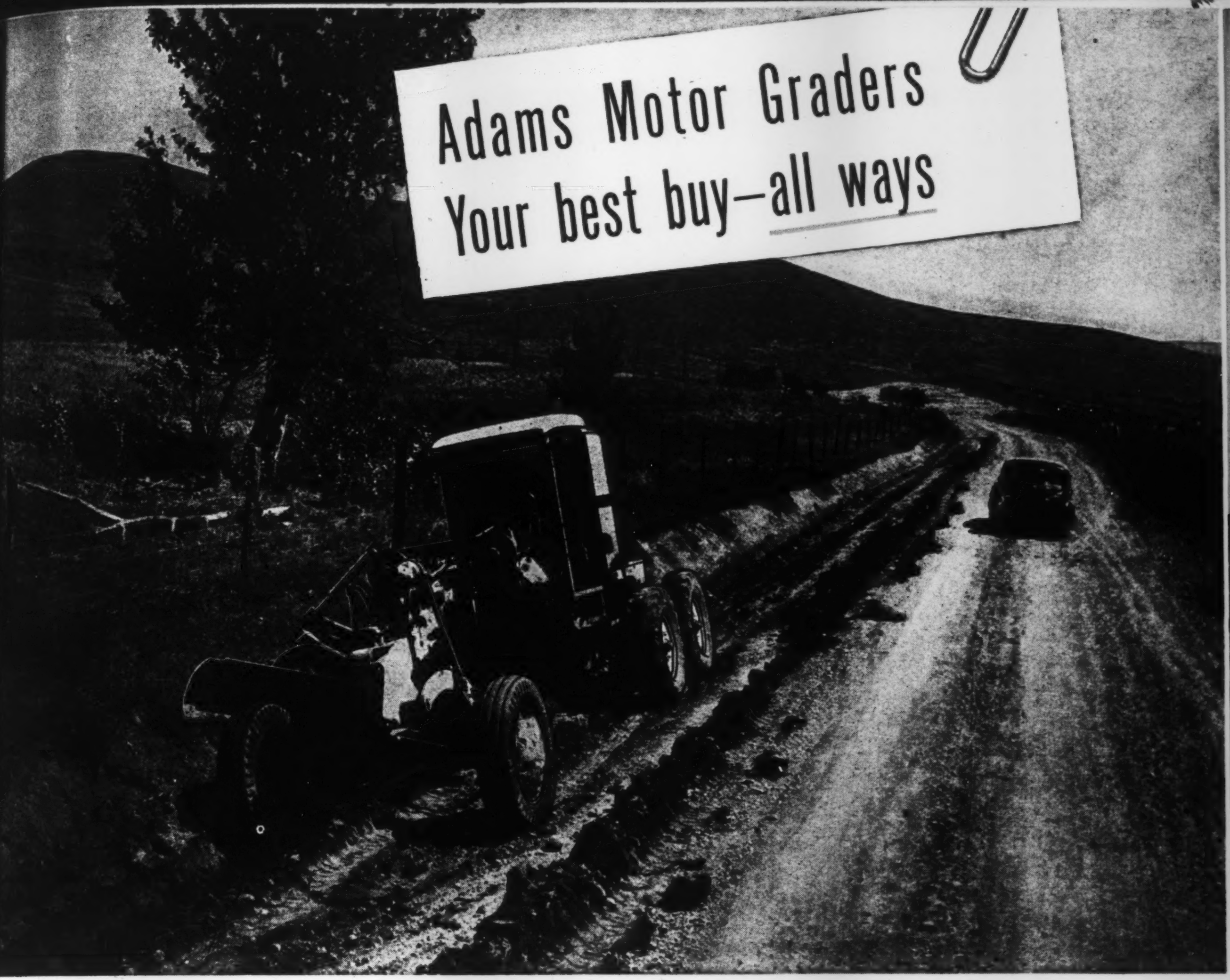
Ralph M. Hansen, for almost three years a civil engineer with Louis C. Kingscott & Associates, Inc., Kalamazoo, Mich., and previously with the New York Central Railroad Co., has opened a civil engineering office at 1,008 Cambridge Drive, Kalamazoo 27, Mich.

H. F. Lassen Landorph is now surveyor in the land and legal department of Richmond Exploration Co., Maracaibo, Venezuela. Born in Denmark, he

Adams
DISTRIBUTORS
Headquarters for
MACHINERY and SERVICE

ALA. . . . Montgomery—Ray-Brooks Machinery Company
Birmingham—Tractor & Equipment Company
ALASKA Fairbanks—Glenn Carrington & Company
ARIZ. . . . Phoenix—The O. S. Stapley Company
ARK. . . . Little Rock—Little Rock Road Machinery Co.
CALIF. . . Western Factory Branch
J. D. ADAMS MANUFACTURING CO.
230 7th Street, San Francisco 3
Adams Distributors at: San Francisco, Los Angeles, Sacramento, Redding, Riverside, San Jose, Fresno, Stockton, Salinas, Santa Rosa, Modesto, Visalia, Merced, Bakersfield, Santa Maria and San Diego
COLO. . . Denver—McKelvy Machinery Company
CONN. . . New Haven—W. I. Clark Company
DEL. . . . Phillips Machinery & Tractor Co., Baltimore
FLA. . . . Jacksonville, Miami, Tampa—Florida Equipment Co.
Pensacola—Ray-Brooks Truck & Tractor Company
GA. . . . . Atlanta—Tri-State, Inc.
Albany—Tri-State Tractor Company
IDA. . . . . Boise & Pocatello—Intermountain Equipment Co.
ILL. . . . . Peoria & Springfield—A. E. Hudson Company
Salem, Carmi—E. W. Werner Equipment Company
Chicago—R. C. Larkin Co.
IND. . . . . Indianapolis—Indiana Equipment Co., Inc.
Evansville—Brandeis Machinery & Supply Co.
IOWA . . . Des Moines—Herman M. Brown Company
KANS. . . Wichita—S. H. Denney Road Machinery Co.
KY. . . . . . Louisville—Brandeis Machinery & Supply Co.
LA. . . . . . Baton Rouge, Monroe, New Orleans — Dunham-Pugh Co., Inc.
MAINE . Portland—Maine Truck-Tractor Co.
MD. . . . . Baltimore—Phillips Machinery & Tractor Co.
MASS. . . Newton Upper Falls—United Equipment Corp.
MICH. . . Bark River—Bark River Culvert & Equipment Co.
Detroit and Grand Rapids—
Wolverine Tractor & Equipment Co.
MINN. . . Minneapolis & Duluth—Rosholt Equipment Co.
MISS. . . Jackson—Mississippi Road Supply Co.
MO. . . . . St. Louis—Missouri-Illinois Tractor & Equip. Co.
Kansas City—Noel V. Wood, Inc.
MONT. . Billings & Missoula—Industrial Equipment Co.
Great Falls—Hi-Line Equipment Co.
NEB. . . . . Omaha—Nebraska Tractor & Equipment Company
North Platte—Cornhusker Tractor & Equip. Co.
NEV. . . . . Reno—Brown Motors
N. H. . . . Manchester—R. C. Hazelton Co.
N. J. . . . . Union—Ehrbar Equipment Co.
N. M. . . . Albuquerque—Hardin & Coggins, Inc.
N. Y. . . . . Buffalo—Dow & Company, Inc.
Brooklyn—Edward Ehrbar, Inc.
Albany, Syracuse—Milton-Hale Mach. Co.
N. C. . . . . Raleigh—J. B. Hunt & Sons
N. D. . . . Fargo—Myhra Equipment Company
OHIO . . . Cleveland—Gibson-Stewart Company
Cincinnati—Rish Equipment Co.
Cambridge—Major Equipment Co.
Richwood—Hamilton Equipment Co.
OKLA. . . Tulsa & Guthrie—C. L. Boyd Company, Inc.
ORE. . . . Portland & Eugene—Howard-Cooper Corporation
PA. . . . . . East Butler—Walsh Equipment Co.
Pittsburgh—Atlas Equipment Corp.
Philadelphia—Service Supply Corp.
Harrisburg & Wilkes-Barre (Kingston)—
State Equipment Co.
R. I. . . . . Providence—Tractors, Inc.
S. C. . . . . Columbia—N. H. Summers Road Machinery Co.
S. D. . . . . Sioux Falls, Rapid City—Empire Equipment Company
TENN. . . Knoxville & Chattanooga—Power Equipment Co.
Nashville—Industrial Tractor & Equipment Co., Inc.
Memphis—Road Builders Equipment Co.
TEXAS . . Dallas & Houston—Browning-Ferris Machinery Co.
San Antonio—Jess McNeel Machinery Co.
Plainview, Abilene, Odessa—Plains Machinery Co.
El Paso—Hardin and Coggins, Inc.
UTAH . . . Salt Lake City—The Lang Company
VA. . . . . . Richmond and Roanoke—Rish Equipment Co.
Alexandria—Phillips Machinery & Tractor Co.
WASH. . . Seattle—Howard-Cooper Corp.
Spokane—Intermountain Equipment Co.
W. VA. . . Charleston and Clarksburg—Rish Equipment Co.
WIS. . . . . Milwaukee, Eau Claire & Green Bay—Bark River Culvert & Equipment Co.

SEE Adams
AD ON OPPOSITE PAGE



Dependability

WITH A SCOTCH ACCENT

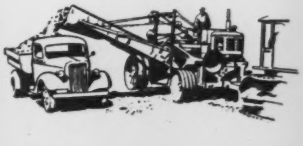
Dependability in an Adams Motor Grader means far more than just reliable, long-life performance. It also means top-flight performance on all types of grading operations . . . *more* completed *work per day, with less effort, at lower cost.*

You'll find the reason for this unfailing, economical dependability in the way Adams Motor Graders are designed and built. You'll find it in their powerful, fuel-thrifty International Diesel Engines—in their rugged, all-welded, machine-finished construction—in their big, husky frames, axles, gears and power-operated mechanical controls.

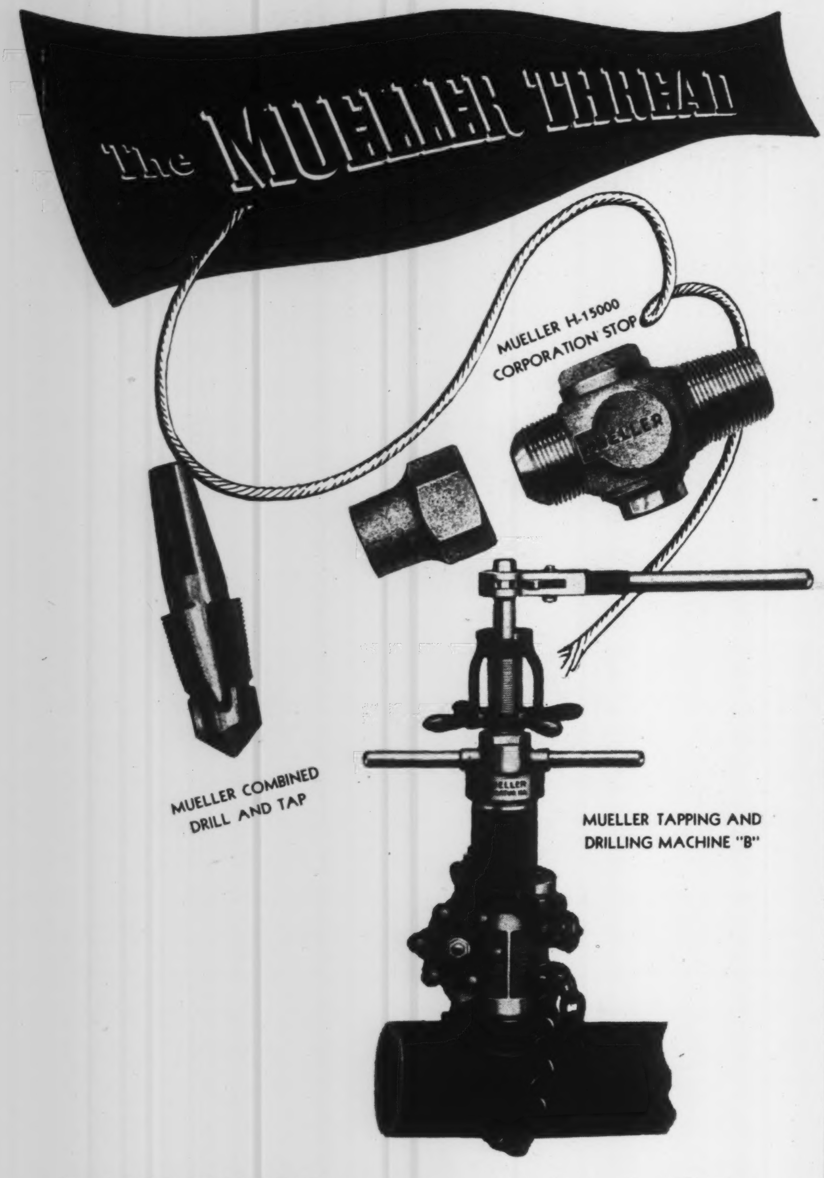
However you look at them, Adams Motor Graders are *your best buy—all ways.* See your local Adams dealer.

J. D. ADAMS MANUFACTURING CO. • INDIANAPOLIS, INDIANA

Adams



MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS


The MUELLER THREAD
MUELLER H-15000 CORPORATION STOP
MUELLER
MUELLER COMBINED DRILL AND TAP
MUELLER TAPPING AND DRILLING MACHINE "B"

The MUELLER THREAD is sometimes referred to as the CC (Corporation Cock) or CS (Corporation Stop) thread because it has long been recognized as the ideal thread for Corporation Stops. It has a steeper taper that gives heavier wall thicknesses next to the body and they run up easily and tightly in the main to give a leak-proof fit. The Mueller Combined Drill and Tap for use with the MUELLER Drilling and Tapping Machine cuts deep, sharp threads in the main that assure accurate alignment of the Stop to the Main. Depend upon MUELLER THREADS when you insert Corporation Stops—over 95% of all waterworks do.

DEPENDABLE SINCE 1857 FULLY WARRANTED
OUR 90th YEAR

MUELLER CO.

MAIN OFFICE AND FACTORY DECATUR, ILLINOIS
OTHER FACTORIES: Los Angeles, Cal.; Chattanooga, Tenn.; Sarnia, Ont. Canada

has worked for American oil companies in Venezuela, Bolivia and Argentina on geological expeditions and also in road building and the construction of drilling camps.

Cyril P. Pesek, who directed construction of two war plants in the Twin Cities area, is now vice-president of the Minnesota Mining and Manufacturing Co. of St. Paul, in charge of engineering. He will be responsible for planning and construction of plants and additions in St. Paul and in other parts of the country. Mr. Pesek formerly was engineer for the Northern Pump Co. Subsequently, for the War Department he was engineer in charge of operations at the Rosemount explosives plant. He is a graduate of the University of Minnesota engineering college, 1925.

J. Wendell Ballard has been appointed the first sanitary engineer for the Floyd County, Ind., Public Health Department.

Harvard Remfer, resident state highway engineer at Sioux Falls, S. D., has been promoted to acting district engineer at Mitchell. **R. N. Calbe** has been named as assistant resident engineer at Sioux Falls.

William C. Hendrickson, engineer, is now in charge of the local office at Brainerd, Minn., for the P. O. Bettenbrug & Co. architects and engineers of St. Paul.

Kline Taylor, until recently assistant Pottawattamie County, Iowa, engineer with headquarters at Council Bluffs, has taken over his new duties as city street commissioner.

K. E. Benson, consulting engineer from Sioux Falls, S. D., has been employed as city engineer at Yankton, S. D. until a new city engineer can be engaged. He succeeds **S. E. Gentle,** who resigned to return to the state highway department in Pierre.

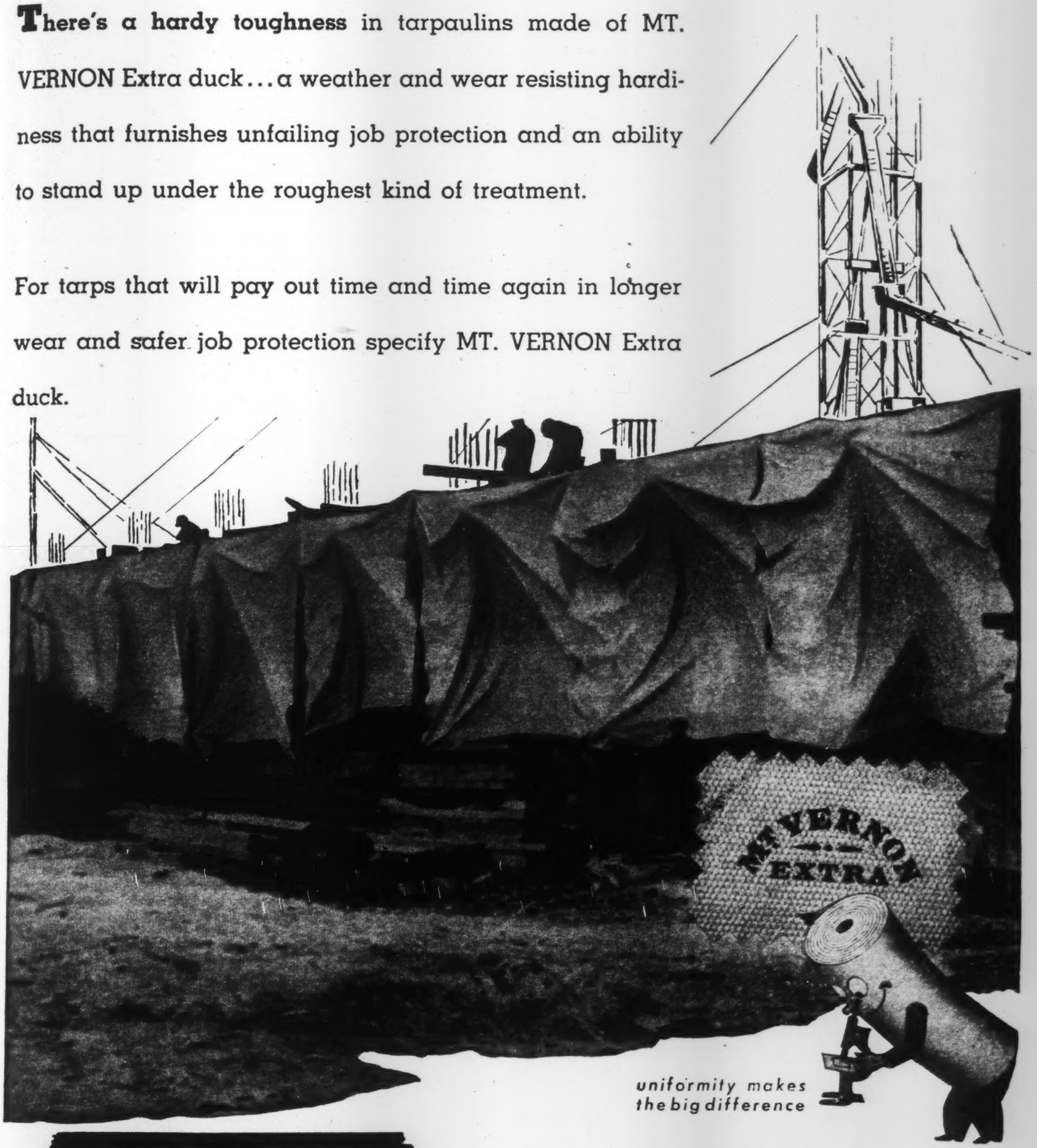
Harold L. Barr, Chadron, Neb., division engineer for the Chicago & Northwestern Railroad Co., Black Hills division, has been promoted to a similar position at Boone, Iowa. He will succeed **Charles Wells,** who is retiring.

Resignation of **Irvin Blakeslee** as maintenance superintendent for Clearfield County, Pa., is announced by the Department of Highways. He will be succeeded by **Niles E. Bartholomew** who has been transferred from the Elk-Cameron County District. Mr. Bartholomew in turn is being succeeded by **Howard A. Senser,** who has been an assistant superintendent in Clearfield County. **Hugh A. Lawhead** has been

A Wear Resistant Duck

There's a hardy toughness in tarpaulins made of MT. VERNON Extra duck... a weather and wear resisting hardiness that furnishes unfailing job protection and an ability to stand up under the roughest kind of treatment.

For tarps that will pay out time and time again in longer wear and safer job protection specify MT. VERNON Extra duck.



uniformity makes the big difference

TURNER HALSEY
COMPANY
Selling Agents
40 WORTH ST. • NEW YORK

Mt. Vernon-Woodberry Mills

Branch Offices: CHICAGO • NEW ORLEANS • ATLANTA • BALTIMORE • BOSTON • LOS ANGELES • AKRON

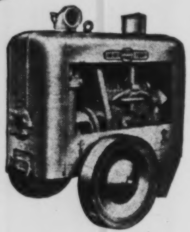
Here's how to handle water—

JAEGER

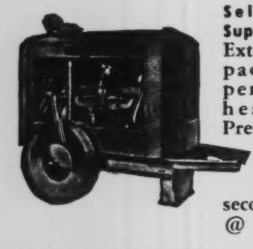
enclosed-type pumps give you steady high efficiency — longer life

To a better engineered, more amply powered, conservatively rated line of pumps, Jaeger has added all-weather protection of all heavy duty models of 2" to 10" size — for sustained efficiency of pump and engine, extra hours of smooth, dependable performance, plus easy accessibility at all times.

2" and 3" Heavy Duty: Most rugged small pumps built. Conservatively rated @ 10,000 and 20,000 g.p.h.



4" to 10" Portables: Compact, extra powerful units of 40,000 to 240,000 g.p.h. rating and exceptional air capacity.



Self-Priming Super-Jet Pump: Extremely compact, yet outperforms old, heavy types. Pressures to 250 lbs.; 90 h.p. engine. Only 30 seconds to prime @ 20 ft.

Only Jaeger Offers All These

Inherent priming action plus "jet" priming — doubly sure and fast . . . long-life "Lubri-Seal," accessible for inspection . . . self-cleaning shell design . . . replaceable liners or seal rings . . . Every pump tested and certified for performance.

Sold, Serviced in 128 Cities

THE JAEGER MACHINE CO.

Main Office, Factory, Columbus 16, Ohio

8 E. 48th St. NEW YORK 17, N. Y.
226 N. La Salle St. CHICAGO 1, ILL.
235-38 Martin Bldg., BIRMINGHAM 1, ALA.

advanced from a junior-grade assistant superintendent for Clearfield County. Another promotion is that of **Jay M. Hoover,** from maintenance foreman to assistant superintendent.

David W. Wilhelm, former city engineer of Tuscaloosa, Ala., and veteran of 33 months' service with the U. S. Engineers in the European Theater, has become city manager of Brewton, Ala.

Harry A. Metcalf, Columbus, Ohio, formerly director of maintenance for the Kentucky Highway Department, has been named chief of the Bureau of Motor Transport, Ohio Highway Department, succeeding **H. S. Perry,** who was named assistant chief of the bureau of maintenance. Metcalf, prior to the last two years, had worked as a county and state engineer for more than 25 years.

B. C. Bevier, Columbus, Ohio, has been named to the recently-created post of Mansfield, Ohio, sanitary engineer. He will supervise the waterworks, sewage disposal, and garage departments. He has been assistant engineer in the Ohio Department of Health.

Bernard A. Brennan has resigned as superintendent of public works of Ogdensburg, N. Y.

John W. Adams, engineer for the federal public housing authority in Wisconsin, has been appointed maintenance engineer for the Greendale housing project, near Milwaukee. A civil engineering graduate of Drexel Institute, he had served as a lieutenant in charge of maintenance and repair at a number of Army camps during the war and previously had designed prefabricated homes for the Harnischfeger Corp., Milwaukee.

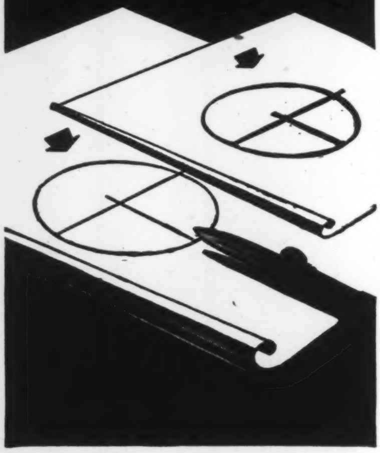
George W. Roberge, secretary of the Seattle, Wash., Municipal Board of Public Works since 1929, has retired because of illness. He entered public service 21 years ago as superintendent of the city building department.

W. L. Keay of Winnipeg, Man., has been appointed assistant city engineer of Brantford, Ont.

Alex R. Stroup, who for the last six years has been city engineer at Iola, Kan., has resigned to go with Black & Veatch, Kansas City.

Howard L. Cheney, Chicago architect, is engaged with the Chicago District, Corps of Engineers, in the design of hospitals for the Veterans Administration. After serving as a colonel during the war with the Air Insallations

Tracing cloth that defies time



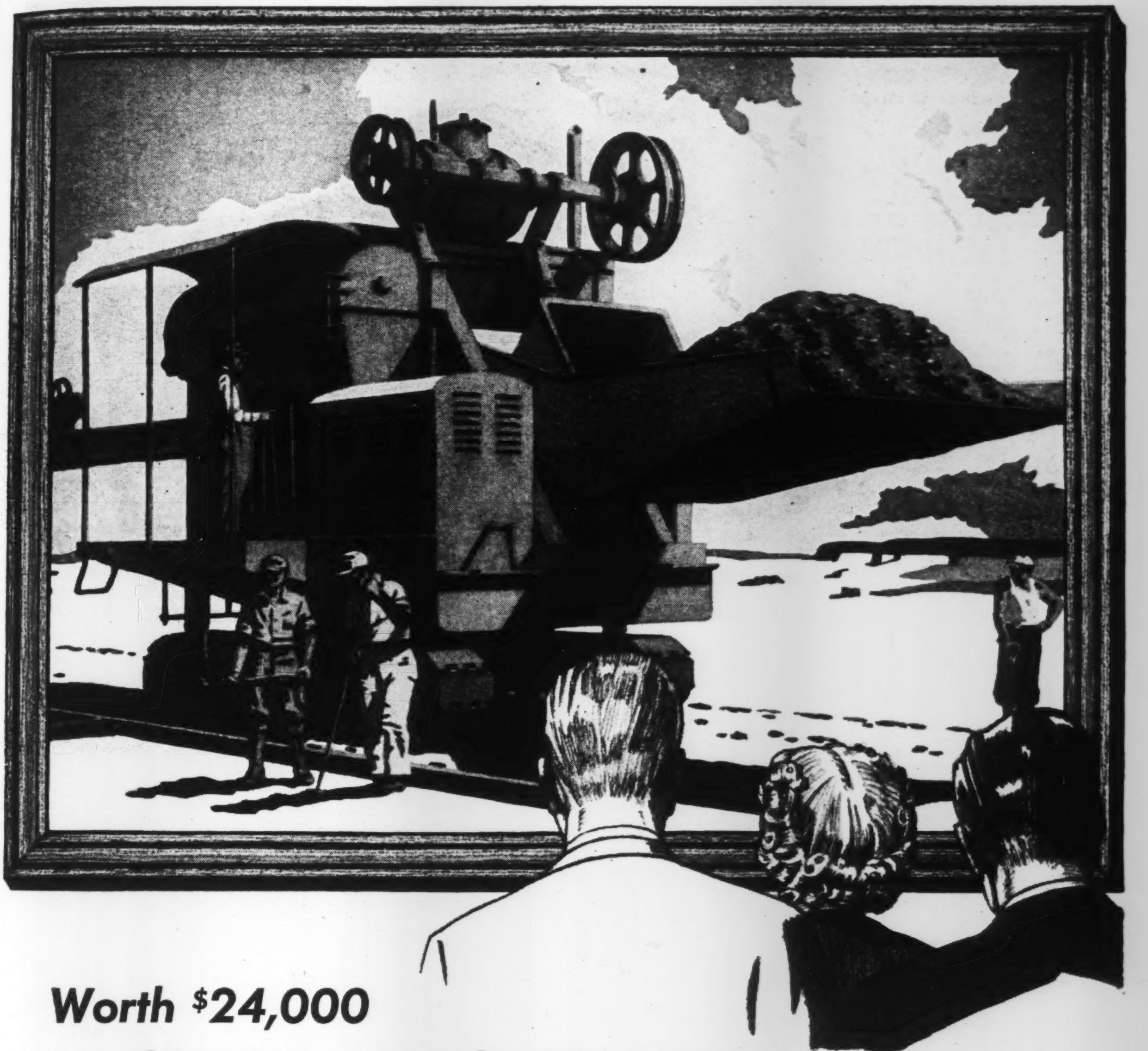
● The renown of Imperial as the finest in Tracing Cloth goes back well over half a century. Draftsmen all over the world prefer it for the uniformity of its high transparency and ink-taking surface and the superb quality of its cloth foundation.

Imperial takes erasures readily, without damage. It gives sharp contrasting prints of even the finest lines. Drawings made on Imperial over fifty years ago are still as good as ever, neither brittle nor opaque.

If you like a duller surface, for clear, hard pencil lines, try Imperial Pencil Tracing Cloth. It is good for ink as well.

IMPERIAL TRACING CLOTH

SOLD BY LEADING STATIONERY AND DRAWING MATERIAL DEALERS EVERYWHERE



Worth $24,000
. . . this picture needs $65 more

This efficient, fast, labor-saving road-paver cost well over $24,000—but it couldn't pave a square foot without wire rope. *That's* what is missing in the picture. How much does the missing wire rope cost? Well—ordinary, non-preformed wire rope costs about $52. The best of all wire ropes—Preformed Improved Plow Steel costs about $65.

Be safe. Be sure. If you use wire rope, use the best. Specify Preformed Improved Plow Steel for your next rope. And when you buy a machine—any machine—make certain it is equipped with Preformed. You will like it because it lasts longer. Your workmen will like it because it is easier and safer to handle.

PREFORMED
WIRE ROPE

WRITE FOR FREE COPY *of helpful book about Preformed.*
Address: Preformed Wire Rope Information Bureau,
520 North Michigan Avenue, Chicago 11.

ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

PREFORMED
WIRE ROPE

HANDLES EASIER - LASTS LONGER

Worthington-Ransome Blue Brute Distributors

See ad on page 89 for list of equipment in each line

Worthington-Ransome Distributors

Ala., Birmingham, Construction Equipment Co.
  Montgomery, Burford-Toothaker Tractor Co.
Alaska, Anchorage, Airport Mach. & Storage Co.
Ariz., Phoenix, Lee Redman Equipment Co.
Ark., Fort Smith, R. A. Young & Son
  Little Rock, R. A. Young & Son
Cal., L. A. Golden State Equip. Co.
  San Francisco, Coast Equip. Co.
Colo., Denver, Power Equipment Co.
Conn., Wallingford, Wilhelm-Davis Co., Inc.
Fla., Gainsville, Constr. Equip. & Supply Co., Inc.
  Miami, Allied Equip., Inc.
  Orlando, Highway Equipment and Supply Co.
  Tampa, Epperson & Company
Ga., Atlanta, Tractor & Machinery Company
Ida., Boise, Olson Manufacturing Co.
Ill., Chicago, Chicago Construction Equip. Co.
Ill., Chicago, Thomas Hoist Co.
Iowa, Cedar Rapids, McNall Mach. & Supply Corp.
Ill., Chicago, J. A. Roche
Ky., Harlan, Croushorn Equip. & Supply Co.
  Louisville, Williams Tractor Co.
Maine, Portland, Maine Truck-Tractor Co.
Mich., Muskegon, Lakeshore Machy. & Supply Co.
Minn., Minneapolis, Phillippi-Murphy Equip. Co.
Miss., Jackson, Jackson Road Equip. Co.
Mo., Clayton, The Howard Corporation
Mo., Kansas City, Machinery & Supplies Co., Inc.
  St. Louis, W. H. Reaves
Montana, Billings, Interstate Truck & Equip. Co.
  Helena, Caird Eng. Works
Nevada, Elko, C. W. Paul Hardware and Machy. Co.
N. J., No. Bergen, American Air Comp. Corp.
N. M., Albuquerque, Bud Fisher Co.
  Roswell, Smith Machy. Co.
N. Y., Albany, Milton-Hale Machinery Co.
  New York, Hodge & Hammond, Inc.
  New York, Railroad Materials Corp.
  Syracuse, Milton-Hale Mach. Co.
N. C., Raleigh, Smith Equip. Co.
N. D., Fargo, Smith Commercial Body Works, Inc.
Ohio, Cincinnati, Carroll Edwards & Co.
  Dayton, Carroll Edwards & Co.
Ohio, Toledo, The Kilcorse Machy. Co.
Okla., Oklahoma City Tatton-Douglass Equip. Co.
Oregon, Portland, Andrews Machinery
Pa., Wilkes-Barre, Ensminger & Co.
  Mechanicsburg, American Equip. Corp.
  Philadelphia, Metalweld, Inc.
S. C., Columbia, Smith Equipment Co.
Tenn., Knoxville, Dempster Bros., Inc.
  Memphis, Independent Tractor Co.
  Nashville, Dempster Bros., Inc.
Tex., Amarillo, T. W. Carpenter Equip. Co.
  Dallas, Shaw Equip. Co.
  San Antonio, Patten Machy. Co.
  Tyler, D. M. McClure Equip. Co.
Utah, Salt Lake City, J. K. Wheeler Mach. Co.
Vt., Barre, A. M. Flanders, Inc.
Wash., Spokane, Andrews Equip. Service
Va., Richmond, Highway Machy. and Supply Co.
W. Va., South Charleston, Allied Equip. Co.
Wisc., Milwaukee, Drott Tractor Co., Inc.

Ransome Distributors

D. C., Washington, M. A. Doetsch Mach. Co.
La., New Orleans, Ole K. Olson Co.
Md., Baltimore, Stuart M. Christhilf & Co.
Mich., Detroit, Thomas G. Abrams
N. Y., Buffalo, Murray Equip. Co.
N. Y., Rochester, B-G Equip. Co.
Pa., Pittsburgh, Arrow Supply Company
O., Cleveland, H. B. Fuller Equip. Co.

Worthington Distributors

Ind., Indianapolis, Reid-Holcomb Company
La., New Orleans, Wm. F. Surgi Equip. Co.
Md., Baltimore, D. C. Elphinstone, Inc.
Mass., Cambridge, Field Mach. Company
Mich., Detroit, W H. Anderson Co., Ind.
  Flint, Gransden-Hall & Co.
N. Y., Buffalo, Dow & Co., Inc.
  New York, Air Compressor Rental and Sales
Pa., Allentown, H. N. Crowder, Jr., Inc.
  Pittsburgh, Atlas Equip. Corp.
Texas, El Paso, Equip. Supply Co.
Washington, Seattle, Star Machinery Co.
Wyoming, Cheyenne, Wilson Equip. & Supply Co.

Worthington Pump and Machinery Corp.
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts

Division, Army Air Forces, on design and construction of airfields and bases, Cheney since his return to private practice has been retained as consulting architect for the University of Illinois building program and for several airport projects.

Roderic B. Thomas, city manager of Corpus Christi, Tex., has been made city manager of Dallas. A graduate of Texas A. & M. College, he has served as city engineer and acting waterworks superintendent of Highland Park, Tex., for 18 years. At one time he was associated with Myers & Noyers, of Dallas, where he was largely responsible for laying out the levees on the Trinty River at Dallas. He succeeds **V. R. Smitham** who resigned to enter private business.

E. B. Brown, superintendent of the water department, Santa Barbara, Calif., since 1944, resigned recently. Mr. Brown was city engineer from 1927 to 1935. **C. M. Pinkham,** engineer in charge of the water treatment plant, has been named acting superintendent until a successor is named.

Paul A. B. Sahn has resigned from Ford, Bacon & Davis, Inc., in Charleston, W. Va., to establish a private practice as consulting engineer on industrial plants, with headquarters at 933 St. James St., Pittsburgh 6, Pa. He spent four years as designing engineer with Koppers Co. and seven years as senior engineer with the Duquesne Light Co. of Pittsburgh.

J. O. Armstrong, of Iola, Kan., an engineer for the Kansas Highway Commission since 1933, has been appointed city engineer at Kansas City, Kan.

A. B. Samuel of Edmonton has been named city engineer of Red Deer, Alta.

E. R. Taylor has been appointed Butler County, Ala., engineer, succeeding **E. Talbert,** who resigned to enter private business.

Franklin Thomas has been appointed by Gov. Earl Warren as a representative of the Metropolitan Water District on the Colorado River Board of California. He succeeds **W. P. Whitsett,** resigned.

Edwards & Hjorth, consulting engineers, have removed their offices to 1,267 Sixth Avenue, New York 19, N. Y.

W. S. Ekern, Glencoe, Minn., who has been with the Minnesota Highway Department for 13 years, has been named county highway engineer for McLeod County with headquarters at Glencoe.

Elections and Activities

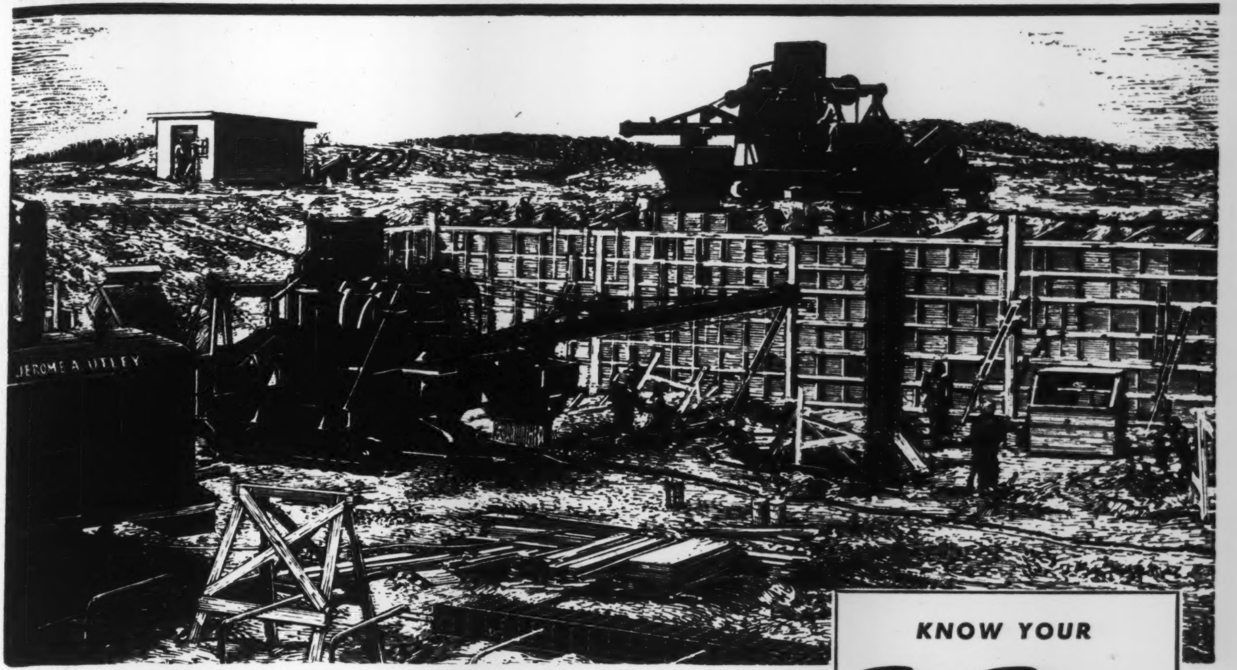
The new officers of the Connecticut Society of Civil Engineers are as follows: President, Albert A. Cross; first vice-president, William D. Wurts; second vice-president, John F. Willis; secretary-treasurer, H. Jackson Tippet. The board of direction consists of the officers and F. Walden Wright, William S. Wise, Dwight A. Hogg, Kenneth H. Holmes, Russell G. Warner, Charles H. Miller, Melville F. Taylor, and William F. Nierintz.

The New York State Section of the American Water Works Association has nominated John Copley, general manager, Elmira Water Board, Elmira, N. Y., to receive the 1947 George W. Fuller Award for distinguished service and leadership in the waterworks fraternity. The award will be made at the national convention in San Francisco, in July. Wendell R. LaDue, president of the American Water Works Association, at a recent meeting of the section asked that adequate salary scales and retirement benefits be established, and that employee-education programs be adopted in order that the public's question may be answered courteously and correctly.

Arizona Sewage & Water Works Association has elected new officers as follows: president, Harold W. Yost, of Yost & Gardner, consulting engineers, Phoenix; first vice-president, John Rauscher, city engineer's office, Tucson; second vice-president A. A. Fredickson, owner-manager of water utilities at Duncan and several other Arizona cities; reelected secretary-treasurer, George W. Marx, sanitary engineer, Arizona State Board of Health. Directors, the president, secretary, and past president Robert M. Cushing, of Headman, Ferguson & Carollo, engineers, Phoenix; John Cook, sanitary inspector and supervisor of sewage plant, Grand Canyon National Park, Ike F. Brown, superintendent of water and sewage, Williams; Ed. W. Daly, city manager, Tempe; A. W. Miller, district manager, H. W. Johns-Manville Co., Phoenix.

The Texas Construction Council met in Ft. Worth recently and elected the following officers: C. P. Dodson, president; H. R. F. Helland, San Antonio, vice-president; and Wm. P. Glade, Ft. Worth, secretary-treasurer; Uel Stephans, Ft. Worth, Director of Publicity. New directors are: J. C. Bisset, Dallas, Representing League of Texas Municipalities; T. C. Forrest, Jr., Dallas,

TO BEAT YOUR ESTIMATE WHEN THE GOING GETS TOUGH



Two Ransome 34E Single Drum Pavers, owned by J. A. Utley Company, Michigan contractor, delivering concrete directly into forms

Concrete for this big Michigan auto factory site was batched at a central mixing plant. Ground conditions kept truck mixers from getting close to the forms. Bridging the gap with crane-carried buckets would have shot costs up far beyond the estimate. So . . .

Ransome Blue Brute Pavers were called in. From well back of the excavated dirt mounds their "live booms" swung their hydraulically-controlled buckets directly over the forms. Spillage was eliminated by the bucket's hydraulic shut-off when the forms were filled . . . Another construction problem solved!

More About the "Live Boom"

It spreads over a wider area with every swing, eliminating hand shovelling . . . Boom can be elevated to 9-ft. clearance under bucket, while paver concretes retaining walls, etc., and lays the slab — all in one operation. *Only Ransome Pavers include the "live boom" as standard equipment.*

Get the Whole Story

Many other advanced features show why 34E's — Single Drum and Dual Drum — are preferred equipment on big construction jobs . . . highways, dams, reservoirs, airport runways, foundations, piers . . . saving costs with every cubic foot of concrete placed. Write for facts on how these famous Ransome Pavers can make more profits for you with their high-speed operation and their low maintenance cost . . . proving *there's more worth in a Blue Brute.* R7-5

KNOW YOUR

BLUE BRUTES

Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your planning on a profitable basis. His name is listed on Page **88**.

RANSOME EQUIPMENT

Pavers, Portable and Stationary Mixers, Truck Mixers, Pneumatic Placing and Grouting Equipment and Accessories.

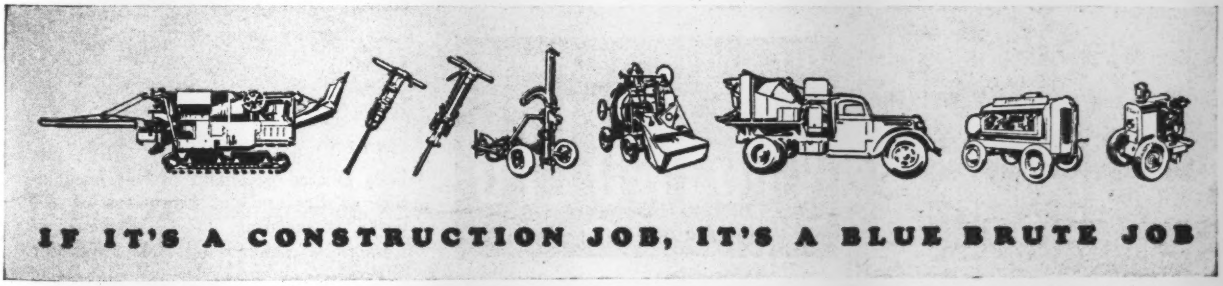
WORTHINGTON EQUIPMENT

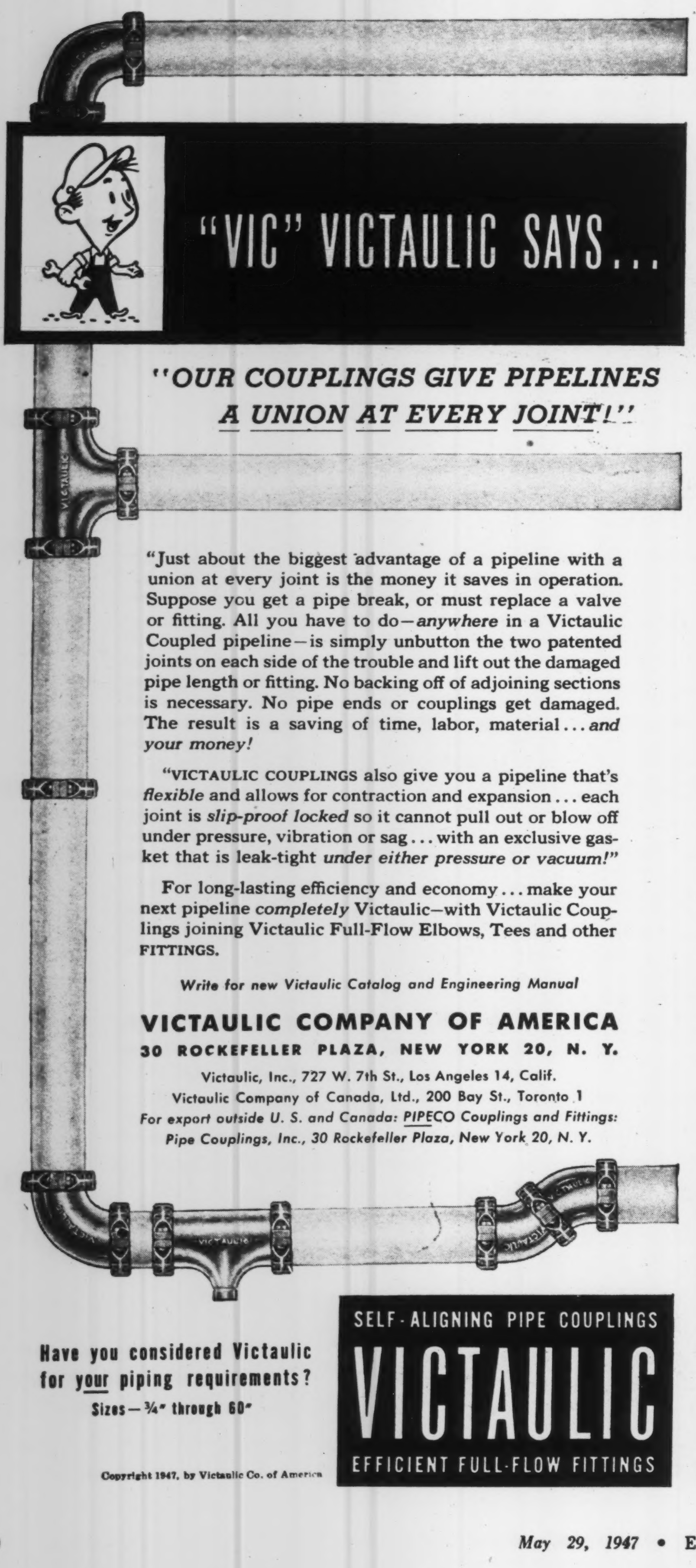
Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Self-Priming Centrifugal Pumps and Accessories.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

BUY BLUE BRUTES


IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB



"VIC" VICTAULIC SAYS...

"OUR COUPLINGS GIVE PIPELINES A UNION AT EVERY JOINT!"

"Just about the biggest advantage of a pipeline with a union at every joint is the money it saves in operation. Suppose you get a pipe break, or must replace a valve or fitting. All you have to do—*anywhere* in a Victaulic Coupled pipeline—is simply unbutton the two patented joints on each side of the trouble and lift out the damaged pipe length or fitting. No backing off of adjoining sections is necessary. No pipe ends or couplings get damaged. The result is a saving of time, labor, material... *and your money!*

"VICTAULIC COUPLINGS also give you a pipeline that's *flexible* and allows for contraction and expansion... each joint is *slip-proof locked* so it cannot pull out or blow off under pressure, vibration or sag... with an exclusive gasket that is leak-tight *under either pressure or vacuum!*"

For long-lasting efficiency and economy... make your next pipeline *completely* Victaulic—with Victaulic Couplings joining Victaulic Full-Flow Elbows, Tees and other FITTINGS.

Write for new Victaulic Catalog and Engineering Manual

VICTAULIC COMPANY OF AMERICA
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
Victaulic, Inc., 727 W. 7th St., Los Angeles 14, Calif.
Victaulic Company of Canada, Ltd., 200 Bay St., Toronto 1
For export outside U. S. and Canada: PIPECO Couplings and Fittings: Pipe Couplings, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

Have you considered Victaulic for your piping requirements?
Sizes—¾" through 60"

SELF-ALIGNING PIPE COUPLINGS
VICTAULIC
EFFICIENT FULL-FLOW FITTINGS

Copyright 1947, by Victaulic Co. of America

Texas Society Professional Engineers; and J. C. Trueheart, San Antonio, Municipal Contractors Association of the Associated General Contractors, Inc., Texas Branch.

The New Mexico Society of Professional Engineers has been organized to succeed the New Mexico Society of Engineers. It plans to affiliate with the National Association of Professional Engineers. G. Perry Steen, of the University of New Mexico, was elected president. Other officers are C. M. Johnstone, district engineer for the state highway department at Santa Fe, vice-president; Steve Reynolds, Albuquerque, vice-president; and W. K. Wagner, Albuquerque, secretary-treasurer. Directors are G. R. Griswold, Albuquerque; J. N. VanSant, Raton; Guy V. Martin, Albuquerque; Caswell Silver, Albuquerque; H. F. Hall, Santa Fe; J. P. Morgan of the New Mexico College of Agriculture and Mechanical Arts at Las Cruces, and E. M. Beahm, Carlsbad.

Ernest Lavigne, engineer commissioner of the Province of Quebec has been elected president of the Corporation of Professional Engineers of Quebec, succeeding E. A. Ryan. J. B. Sterling was named vice-president and J. Antonio Lalonde, secretary-treasurer.

The Southeast Georgia chapter of the Georgia Society of Professional Engineers received its charter April 15 at ceremonies held at Waycross. Robert L. Pittman was installed as president. Other officers included R. T. Littlefield of Jesup, vice-president; H. D. Watts, Jr., of Waycross, secretary-treasurer; E. A. Logan, of Ocilla, state representative. Cherry L. Emerson, dean of engineering at Georgia Tech and president of the Georgia Society of Professional Engineers, and other prominent members of the society were present at the charter ceremonies.

Walter E. Carlson of the Carlson Construction Co., highway contractors of Essex, Iowa, has been named president of a group of 28 contractors to be known as the Southwest Iowa Contractors' Conservation Association, organized to further conservation work for land owners in that section. It will work with the extension service of Iowa State College, the Soil Conservation Service, the state highway commission. Homer Focht of Red Oak, Iowa, was named vice-president and Cecil Beggs of Tabor, Iowa, secretary-treasurer.

J. S. Irwin of Calgary, Alta., has been elected president of the Association of Professional Engineers of Alberta, succeeding L. C. Stevens of Edmonton. Other officers elected were:

First, **INDUSTRIAL TRUCKS . . .**

Then, **PALLETIZED UNIT LOADS . . .**

Now, **STANDARDIZED**

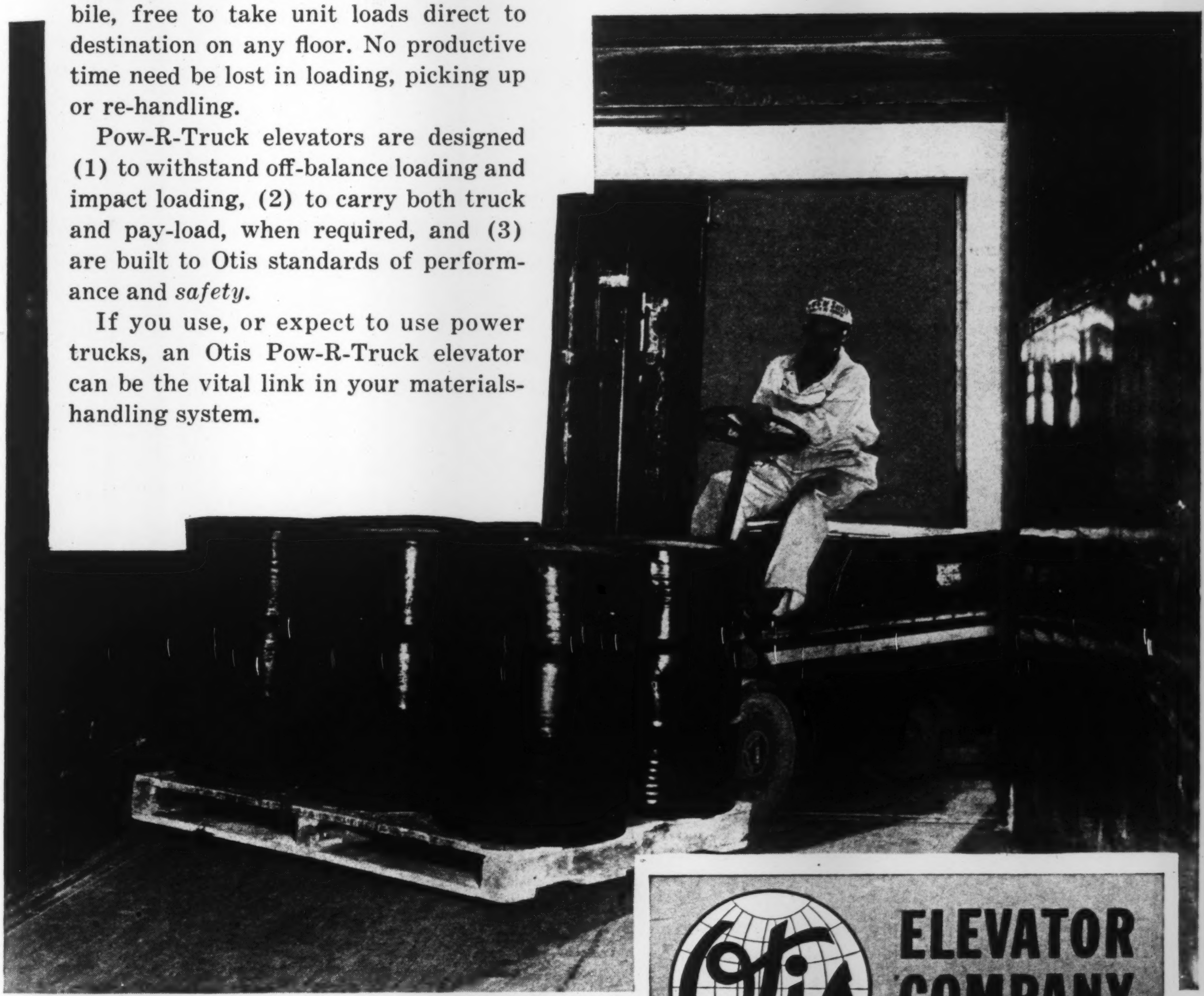
POW-R-TRUCK ELEVATORS!

This latest addition to the Otis line of standardized freight elevators—previously available only as a custom-built "special"—adds *floor-to-floor travel* to the many other time- and labor-saving advantages of industrial trucks . . . effectively increasing their usability.

With a Pow-R-Truck elevator an industrial truck becomes *completely* mobile, free to take unit loads direct to destination on any floor. No productive time need be lost in loading, picking up or re-handling.

Pow-R-Truck elevators are designed (1) to withstand off-balance loading and impact loading, (2) to carry both truck and pay-load, when required, and (3) are built to Otis standards of performance and *safety*.

If you use, or expect to use power trucks, an Otis Pow-R-Truck elevator can be the vital link in your materials-handling system.



For illustrated folder please address Otis Elevator Company, 260 Eleventh Ave., New York 1, N. Y.

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

*DAREX

CONTROLLED AIR WITH

AEA

To date, DAREX AEA has been used in approximately 15,000,000 cubic yards of concrete—in highway and pavement construction, in mass concrete, and in structural concrete.† In all of these projects control of entrained air was of utmost importance. Despite a wide range of mixes, aggregates, and field conditions, the required percentage of entrained air was obtained by simple adjustment in the amount of DAREX AEA used.

†DAREX AEA is also extensively used in concrete products.

DAREX

DISPENSERS FOR

AEA

Hand operated, semi-automatic, and fully automatic DAREX dispensers are now available for adding DAREX AEA to the concrete batch. These dispensers are inexpensive, accurate, sturdy, and very flexible in their adaptability to existing plants. We offer a choice of models for ready mixed concrete plants, paving mixers, and concrete plants as set up for dams and large concrete structures. For further information, write Dewey and Almy.

Try

In air entrained concrete it's the controlled air that counts.

on your next job

*T. M. REG U. S PAT. OFF.

DEWEY AND ALMY CHEMICAL COMPANY

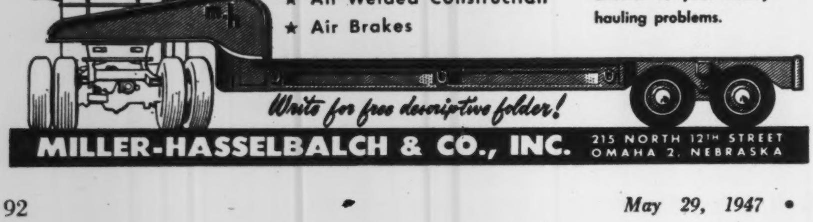
CHICAGO, ILL. CAMBRIDGE, MASS. OAKLAND, CALIF.

RUGGED STRENGTH FOR HEAVY HAULING

The m·h "25" Semi

With electric welding throughout . . . sturdy steel construction . . . and careful attention to weight distribution, the M-H "25" is the ready answer to your heavy hauling problems.

- 25 Ton Capacity
- Tandem oscillating axles
- All Welded Construction
- Air Brakes



Write for free descriptive folder!

MILLER-HASSELBALCH & CO., INC. 215 NORTH 12TH STREET OMAHA 2, NEBRASKA

vice-president, C. S. Clendening, Lettsbridge; councillors, J. M. Campbell, Lettsbridge; B. W. Pitfield, Edmonton; and B. H. Corey of Calgary.

Former officers of the Civil Engineer Corps will organize a reserve component in Western New York, it was decided at a meeting in Buffalo. Perry A. Wilson of Niagara Falls is in charge of plans.

The Virginia Industrial Wastes and Sewage Works Association was organized recently at Roanoke and has requested affiliation with the Federation of Sewage Works Associations. Among the delegates were W. H. Wisely, and Francis S. Friel, executive secretary and president, respectively, of the federation. Officers elected were: President, R. W. Digges; vice-president, B. L. Strother; secretary-treasurer, A. H. Paessler; and director to the federation, L. L. Hedgepeth. The first annual meeting of the association is planned for October 16-17 next at the Hotel Nansemond, Ocean View, Va.

A chapter of the Associated General Contractors of America has been organized at Montgomery, Ala., with Kenneth Upchurch, of W. R. Upchurch Construction Co. as president. The chapter will devote its activities towards the reduction of building costs.

Richard W. Clouse has been elected president of the Engineering Professions Club of Jacksonville, Fla. Other new officers are: C. F. Garland, vice-president; C. N. Farmer, secretary; John F. Shea, treasurer; and James F. Shivler, program director.

W. O. Snyder has been appointed executive secretary of the Kentucky Association of Highway Contractors to fill the place of the late W. P. Humble. For 11 years he was field engineer for Kentucky for the Portland Cement Association, and before that was chief engineer of the Kentucky Department of Highways.

Quebec branch of the Engineering Institute of Canada has elected P. A. Dupuis, assistant chief engineer, Quebec Department of Public Works, president. Stephen J. Walker was elected vice-president, R. Des Gardins, secretary-treasurer and Rene Riout, councillor.

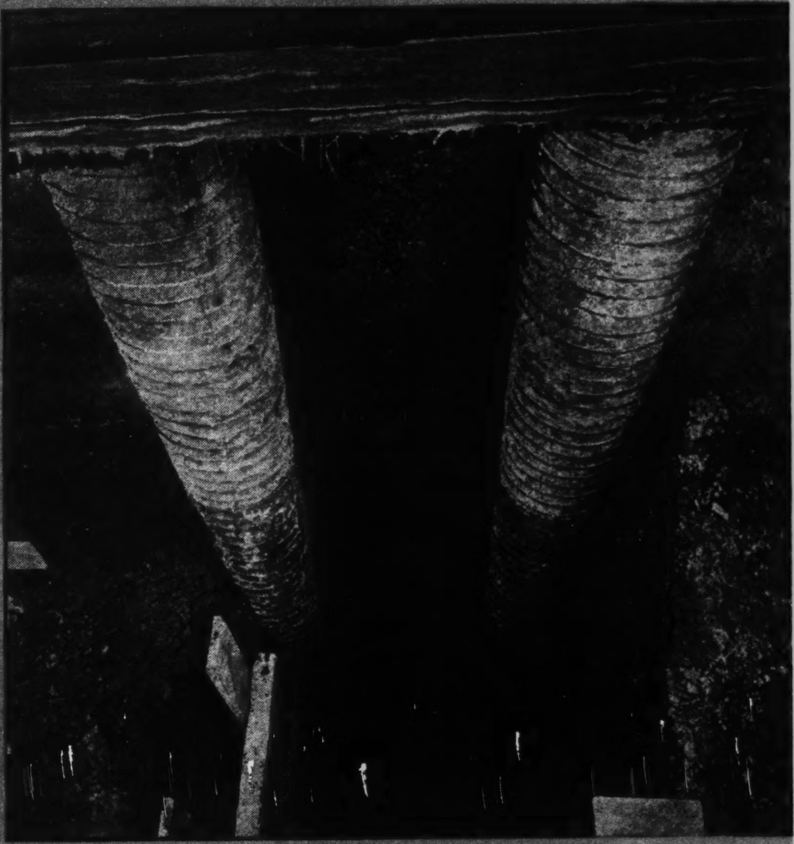
The recently formed Cedar Rapids Engineers Club at Cedar Rapids, Iowa, has elected T. A. Hunter of the Collins Radio Co. president; H. R. Mullinex of the Howard R. Green Co., engineers, vice-president; T. J. Rodhouse of the Iowa Steel & Iron Works, secretary; and A. S. Devries of the Iowa State highway department, treasurer. H. F.

ADVANTAGES OF RAYMOND
CONCRETE PILES • NO. 1

permanency

OTHER ADVANTAGES:

Greater Carrying Capacity • Uniform Bearing Capacity • Engineered for the Job • Saving in Construction Cost • Complete Satisfaction



Every Raymond Concrete Pile is a permanent achievement, accomplished by a series of carefully planned steps. When you specify Raymond Concrete Piles you can be sure of a safe subsurface support that is permanent.

* * *

Consult our engineers for the rest of the facts.

Illustrated: Raymond Piles Exposed by Excavation After 20 Years' Service at Elizabethport for the Central Railroad of New Jersey.

50 YEARS FOUNDED IN 1897 OF PROGRESS

SCOPE OF RAYMOND'S ACTIVITIES

includes every recognized type of pile foundation—concrete, composite, precast, steel, pipe and wood. Also caissons, underpinning, construction involving shore protection, shipbuilding facilities, harbor and river improvements and borings for soil investigation.

RAYMOND
CONCRETE PILE CO.
Branch Offices in Principal Cities
of United States and Latin America
140 CEDAR STREET • NEW YORK 6, N. Y.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

This pipe after
BEING GUNITED CARRIED
LOAD of 33,000 lbs WITHOUT
CRACKING or DEFLECTING
another pipe not gunited
CRACKED and COLLAPSED
with load of 17,300 lbs.

"GUNITE" SAVES SEWER IN CANADA

The pictures tell the story. A 6-months old concrete pipe sewer line at Owen Sound, Ontario was found to be failing under earth load. The tests shown above were made and convinced the city officials that a reinforced "GUNITE" lining would correct the trouble, and we did the job in 1934. The sewer was 36" and 48" diameters and one-half mile long.

"GUNITE" is ideal for lining and strengthening old brick or concrete sewers and has been widely used for this purpose.

Our 72-page bulletin A2300 describes scores of profitable uses of "GUNITE." Write for your free copy.

WISCONSIN-POWERED REX MIXERS ...Keep the Cement Gang on the Move!

There's never an idle moment for men and equipment when a WISCONSIN 20 hp. Model VE-4 Air-Cooled Power Unit takes over the operation of a concrete mixer . . . or any machine, on any job, within the power range of any heavy-duty Wisconsin Air-Cooled Engine. Job-delaying shutdowns seldom occur with a Wisconsin Engine on the job.

Contributing factors to Wisconsin heavy-duty serviceability and dependability include: dynamically balanced crankshaft, mounted on Timken tapered roller bearings, *both front and rear;* mirror-finished crank-pins and cylinders; extra-long connecting rods; *positive air-cooling;* high tension rotary type outside magneto with impulse coupling for quick, easy starting in any weather.

You can get more service out of men and equipment if you entrust the power load to a Wisconsin Air-Cooled Engine . . . in a complete range of sizes from 2 to 30 hp.

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN
World's Largest Builders of Heavy Duty Air-Cooled Engines

Allen of the Link-Belt Speeder Corp. and L. R. Boettcher of the Milwaukee RR Co. were named directors.

The Minneapolis-St. Paul post of the Society of American Military Engineers has elected Col. Carl T. Nordstrom, Minneapolis, president; Lieut. Col. J. C. Robbers, St. Paul, vice-president; Lt. W. H. Nord, St. Paul, secretary-treasurer. Lieut. Col. P. J. McCauley and Col. W. K. Wilson, Jr., both of St. Paul, were named directors.

The Eighth District Society of the Minnesota Association of Professional Engineers held a meeting recently at Coleraine, Minn., when N. G. Helland, Hibbing, was elevated from vice-president to president, succeeding Ellsworth R. Boyce, formerly of Virginia, Minn., and transferred to Rochester, Minn., where he is district highway superintendent. O. T. Berge, Hibbing, was elected vice-president.

A statewide Minnesota building trades council, comprising 12 localized councils throughout the state, was recently granted a charter by the national AFL headquarters. Frank Thill, St. Paul, a vice-president of the Minnesota Federation of Labor, is temporary president of the new unit, which will be the largest body of its kind in the state. One of the major aims of the council will be standard working agreements with the Minnesota contractors, including those in rural areas not now covered by union contracts.

Charles H. Bechert, director of the Water Resources Division of the Indiana Conservation Department, told the Indiana Section of the American Water Works Association recently that a vastly improved system of retaining surface water runoff in spring seasons for use during dry months of late summer would bring many new industries to Indiana. He cited work to be done along this line, in the Muscatatuck River Valley and Laughery Creek in southern Indiana, where the maximum flow is 25,000 and 17,000 sec. ft., respectively, at various times. For three to five months, he said, the flow in these rivers is practically halted.

He said "similar conditions exist in other parts of the state. To impound and store surface waters for use during dry seasons not only would add to our water resources, but would minimize flood dangers as well."

Other speakers included C. Mervin Palmer, associate professor of botany at Butler University, who discussed "Algae in Water," and Donald H. Maxwell, consulting engineer of Alvord, Burdick & Howson, speaking on "How Do You Figure the Needed Capacity of an Elevated Storage Tank?"

Manufacturers' Activities

Appointment of G. D. Andrews, former vice-president and general manager of Fabricated Buildings, Inc., Springfield, Mo., as advertising and sales promotion manager of Dearborn Motors Corporation has been announced.

Jack C. Gay has been appointed sales engineer for Hercules Steel Products Co., Galion, Ohio, while Vernon R. Teasley has been named West Coast representative.

Harold V. Rasmussen has been appointed chief engineer of the turbine department of the De Laval Steam Turbine Co., Trenton, N. J.

Walter F. Rockwell, president of The Timken-Detroit Axle Co., Detroit, Mich., announces that construction has been started on a new Timken axle brake plant at Ashtabula, Ohio.

The Heil Co., Milwaukee, Wis. has announced the appointment of Leonard C. Andersen as district manager of District 8, covering the Southwest states of California, Arizona and Nevada, with headquarters at Los Angeles, Calif.

Frederick H. Vogel, wood technologist of wide experience, has joined the laboratory staff of the Timber Engineering Co., Washington, D. C.

The Heil Co., Milwaukee, Wis. has appointed Gordon S. McKenty as merchandising manager of the company's road material division.

Alfred J. Yardley has been elected president of Jenkins Bros., manufacturers of valves, succeeding his father, Farnham Yardley, who becomes chairman of the board, after serving as president for the past 30 years.

The opening at Baltimore, Md., of an American Lumber and Treating Co. plant designed to alloy wood with creosote, Wolman Salts and Minalith flameproofing salts has been announced.

Fruehauf Trailer Co., Detroit, announces the appointment of R. B. Hollingsworth as regional manager of the Southeast area, with headquarters in Atlanta. He succeeds E. E. Springer, who is named manager of Fruehauf's new Florida branch, under construc-

◇ "VAN DYKE" EBERHARD FABER. U.S.A. — 2H CHISEL POINT

Fewer resharpenings with MICROTOMIC VAN DYKE exclusive rectangular shape Chisel Point Leads

Think of the better work you can do, particularly on big-scale plans and drawings. The efficient rectangular lead sharpens with 20% more graphite at its chisel point—and wears just that much longer.

It's the same HI-DENSITY graphite that gives round-lead VAN DYKES their great advantage in reproduction quality. Extra opacity for sharper, clearer points.

The special Chisel Point Leads come in 6H, 4H, 2H, HB, 2B and 4B. Clip the coupon, and try one!

EBERHARD FABER

37 Greenpoint Avenue Dept. ENR-5 Brooklyn 22, New York

I'd like to experiment with a FREE SAMPLE
________degree Chisel Point VAN DYKE.

Name________________
Firm________________
Street & No.________________
City & State________________
Dealer's Name________________

When Trouble Hits the Ceiling

Water vapor condensing on roof members causes trouble aplenty if building materials used there can't stand moisture. Upkeep costs skyrocket.

Use Wolmanized Lumber* and another of your worries disappears. It's standard structural lumber, pressure-impregnated with Wolman Salts* preservative, making it highly resistant to decay that's fostered by the presence of moisture.

FOR FLOORS, TOO

You head off decay, reduce maintenance costs, by setting your floor on Wolmanized Lumber subflooring and nailers.

Wolmanized Lumber gives the builder all of wood's advantages—speed of erection, light weight, resilience, high insulating value, paintability, low first cost—plus long life.

AMERICAN LUMBER
&
TREATING COMPANY
CREOSOTING
FLAMEPROOFING
WOLMANIZING

*Registered trademarks

1649 McCORMICK BUILDING, CHICAGO 4, ILLINOIS

tion at Jacksonville. Dozier L. Hood is promoted to branch manager. With the acquisition of the Carter Manufacturing Co. and its branches in Memphis, Nashville and Birmingham, N. A. Carter, Jr., is appointed Fruehauf-Carter regional manager covering the mid-South area.

THE J. D. ADAMS MANUFACTURING Co., Indianapolis, Ind., announces the appointment of Buel Wallis as Eastern division sales manager. All sales east of the Mississippi will come under his jurisdiction, as well as federal sales.

The advancement of two of MASONITE CORP.'s sales executives has been announced: Earl W. Hadland has been made manager of dealer sales. Elmer R. Graebner succeeds Mr. Hadland as manager of the firm's Chicago division.

ROBERT L. MILLER has been appointed district sales manager for all Heil products in the central states of Iowa, Missouri, Nebraska, Kansas, and Colorado, with headquarters at Kansas City.

Appointment of two new regional managers, Walter N. Westland for the eastern and George W. Stevens for the mid-continent regions, has been announced by the CUMMINS ENGINE Co., INC., Columbus, Ind.

Announcement is made by the LINK-BELT SPEEDER CORP., of the transfer of the general sales, credit and accounting departments from Chicago to 1201 Sixth St., S.W., Cedar Rapids, Ia. Communications and telephone calls pertaining to repair parts for the series "300" and "500" machines only, will continue to be handled at the Chicago office.

The appointment of EDWARD EHRBAR, INC., Brooklyn, N. Y., and Ehrbar Equipment Co., Irvington, N. J., as distributors for Gradall—new multipurpose earthmover being manufactured by the Warner & Swasey Co.—is announced.

Edgar F. Schaefer, executive vice-president of GARDNER-DENVER Co. was elected company president and H. G. Myers, former president, became chairman of the executive board at the annual stockholders meeting held March 28 at Quincy, Ill.

Appointment of T. R. JOHNSON as general manager of the Keystone Asphalt Products division of the America-Marietta Co. has been announced.

Manufacturers' Publications

Valves (4-p. bulletin) Describes and illustrates seven types of valves for automatic control of water pressures and levels. — *Golden-Anderson Valve Specialty Co., 1703 Keenan Bldg., Pittsburgh 22, Pa.*

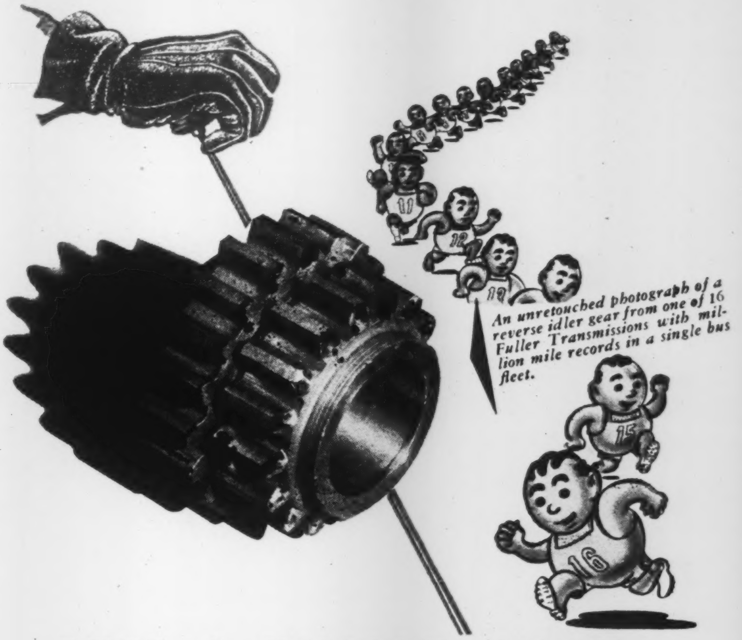
Fabricators Directory—Lists names and addresses of 76 companies and shows the type of timber structures they fabricate. Information is also given on firms that have facilities for treatment of fabricated lumber with preservatives or fire retardants.—*Timber Engineering Co., 1319 18th St., N. W., Washington 6, D. C.*

Package Substations—(78-p. publication) Describes new package substations for utility and industrial power distribution. It presents data on full line of complete and coordinated package substations rated from 750 to 45,000 kva., with information on procedure for selecting standard arrangements to conform to existing requirements. Along with photographs of each substation is one-line diagram of system. Also listed are components, ratings, and dimensions. Thirty illustrated arrangements are provided as guides for selecting suitable unit. Five-step ordering guide is outlined.—*General Electric Co., Schenectady, N. Y.*

Surveying Instruments—(12-p. bulletin) Gives comprehensive information and prices on transits and levels, including all specifications on instruments and accessories. Also available is 8th Catalog Edition, which contains 217 p. of information on all types of surveying, building and engineering instruments and accessories.—*David White Co., Milwaukee, Wis.*

Gunite Building Construction—(4-p. folder) Discusses process of constructing stores, theaters, and medium-size buildings with solid reinforced Gunite. Methods used by the company are illustrated in logical steps.—*Johnson Western Co., Box 6, San Pedro, Calif.*

Pumps — (12-p. bulletin) Covers technical data, application pictures, cross-section drawings of parts, operation and design features, dimensional sketches and assembly procedure for Hydropress, which is designed to replace complex displacement-type pumps.—*Byron Jackson Co., Box 2017 Terminal Annex, Los Angeles 54, Calif.*



An unretouched photograph of a reverse idler gear from one of 16 Fuller Transmissions with million mile records in a single bus fleet.

OVER A MILLION MILES . . .
AND STILL GOING STRONG

A million gruelling road miles . . . equal to three years of continuous driving at 40 mph . . . equal to 40 trips around the earth at the equator . . . that's a recently reported performance record . . . *not of a single Fuller Transmission but of 16 Fuller Transmissions within a single bus fleet. And these 16 Transmissions are still in service.*

Long wear-life like this . . . plus faster schedules and heavier payloads . . . are dividends earned by profit-wise operators who rely on the Fuller Manufacturing Company, builders of Unit and Auxiliary Transmissions for Heavy-duty Service.

FULLER MANUFACTURING CO., TRANSMISSION DIVISION
KALAMAZOO 13F, MICHIGAN
Unit Drop Forge Division, Milwaukee 1, Wisconsin
Western District Office (Both Divisions): 308 Thayer Bldg., Oakland 12, California

Fuller TRANSMISSIONS

MacArthur

37 YEARS INSTALLING PILES
OF EVERY TYPE

CAST-IN-PLACE	STEEL
CONCRETE	SECTIONAL PIPE
COMPOSITE	TIMBER

SOIL AND ROCK BORINGS

MacARTHUR CONCRETE PILE CORPORATION
18 EAST 48th STREET, NEW YORK 17, N Y
BOSTON • CINCINNATI • [illegible]

CONSTRUCTION REPORTS

Proposed Work

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 18, N. Y.
ELSIE EAVES, Manager J. A. MAHONEY, Reports J. V. McEWEN, M. R. ROESSLER, Statisitcs

WATER SUPPLY

PROPOSED WORK

Ala., Bessemer—City, WW imprv., Proj. 1-P-275. **$179,000.** J. W. Goodwin Eng. Co., 726 S. 29 St., consult. engr.

Ind., Hammond—Bd. WW Trustees, S. D. Muskoff, secy., City Hall, WW imprvs., 5 m. g. water storage reservoir, 4 rein.-con. reaction basins, 1 rein.-con. coagulation basin, 4 rein.-con. rapid sand filters. **$600,000.** H. Tom Tuinman, 4762 Calumet St., consult. engr. Harold E. Beine, City Hall, city engr. CD 8/12/46—ENR 8/22/46.

Ky., Newport—City, water treatment plant and enlarging filter plant. **$250,000.** J. Stephen Watkins, Lexington, consult. engr. CD 2/18—ENR 3/6.

★**Mo., St. Louis**—City, c/o M. M. Kinsey, pres. Bd. P. Service, 304 City Hall, Zone 3, clear water storage basin at Chain of Rock WW Plant **$871,000;** pressure conduit to carry water from Baden Pump. Station to Clayton Rd. to interconnect. conduits from Chain of Rocks and Howard Bend WW Plants, **$1,806,000;** pressure conduit from Chain of Rocks WW Plant to Baden Pump. Station, **$140,000.** T. J. Skinker, 312 City Hall, Zone 3, water comr.

Pa., Hellertown—Hellertown Boro Authority, reservoir and dam. **$117,250.**

Pa., Southampton — Upper Southampton Twp., water sys., incl. well and pump house. **$137,040.**

Tex., Dickinson—Galveston Co. Water Control & Imprvt. Dist. 1, Charles H. Garner, pres., water lines, **$40,000;** WW sys., **$152,000;** water facilities addns., **$42,000.** Joe J. Rady, 811 Insurance Bldg., Fort Worth, consult. engr.

Tex., Houston — Harris Co. Fresh Water Supply Dist. 14, A. A. Williams, Chn., Route 5, Box 1170, water distr. sys., steel elevated tank, c.i. pipe, fittings and hydrants, water well. **$136,650.** Frank J. Metyko, 608 Scanlan Bldg., consult. engr.

Tex., Monahans—City, E. D. Duffey, mayor, voted bonds, WW sys. imprvs., expansion. **$135,000.**

Tex., Texas City—City, J. C. Trahan, mayor, imprv. WW sys. **$100,000.**

Tex., Vidor—Orange County Water Control & Imprvt. Dist., WW sys. **$160,000** tentative. Koch & Fowler, Great Natl. Life Bldg., Dallas, consult. engr.

Tex., Wharton—City, F. S. Haines, mayor, WW sys. **$52,000.** Wyatt C. Hedrick Co., 5201 Fannin St., Houston, Zone 4, consult. engr.

Wyo., Gillette—City water treatment plant. **$109,000.**

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Ark., Cabot—E. L. Bailey, mayor, Cabot, sewerage sys. **$100,000.** L. A. Henry, 1018 Pyramid Bldg., Little Rock, consult. engr.

Ark., Malvern—City, J. A. Wallis, supt., sewerage sys. addns. **$236,000.** M. L. Crist & Assoc., Union Life Bldg., Little Rock, engrs. and archts. CD 9/14/45—ENR 9/27/45.

Ark., Russellville — Arkansas Polytechnic College, Dr. J. W. Hull, pres., sewer imprvs., incl. line extens., distr. sys. revision. **$160,000.** Wittenberg, Delony & Davidson, 807 Pyramid Bldg, Little Rock, consult. engrs.

Calif., Alhambra—City, City Hall, bond election June 3, municipal incinerator. **$250,000.**

★**Calif., Arcadia**—City, City Hall, sanitary sewers and disposal plant. **$1,000,000.** Koebig & Koebig, 458 S. Spring St., Los Angeles, engrs.

Calif., Orland—City, City Hall, defeated **$170,000** bonds sewage disposal plant. C. G. Hyde, 2599 Buena Vista St., Berkeley, and D. H. Caldwell, 1182 Market St., San Francisco, consult. engrs. CD 3/26—ENR 4/17.

★**Calif., Walnut Creek**—Central Contra Costa Sanitary Dist., Veterans Memorial Bldg., **$2,400,000** bond election June 3, sewage treatment plant, central and secondary trunk sewer lines, Clyde C. Kennedy, Atlas Bldg., 604 Mission St., San Francisco, consult. engr. CD 11/20—ENR 1/2/12.

Idaho, Lewiston—City, City Hall, sewage treatment plant and trunk sewer. **$475,000.** W. P. Hughes, city engr. CD 6/4/45—ENR 6/14/45.

La., Jennings—John Conner, mayor, Jennings, exten. sewage collection sys. **$160,000;** sewer line extens., **$175,000.** Barnard & Burk, 314 Triad Bldg., Baton Rouge, consult. engrs. CD 6/31/45—ENR 7/12/45.

Minn., Duluth—City, C. D. Jeronimus, clk., sanitary sewers serving Woodland area, connecting with sewer at 18 Ave. E. and 4 St., **$150,000;** sewer disposal facility extens. from 51 Ave. W. to connect 4 suburban communities with existing sewage disposal plant, **$266,186.** A. W. Tewes, city engr.

Minn., Lester Prairie—Village, H. Schmidt, mayor, sanitary sewerage sys., sewage treatment plant, and watermain exten. **$179,900.** Hitchcock & Estabrook, 521 Sexton Bldg., Minneapolis, consult. engrs.

Minn., Robbinsdale—City, E. A. Jaenisch, clk., storm sewers. **$250,000.** Hitchcock & Estabrook, 521 Sexton Bldg., Minneapolis, consult. engrs.

Minn., Watertown—Village, M. M. Lundquist, clk., sewage treatment plant. **$125,000.** Hitchcock & Estabrook, 521 Sexton Bldg., Minneapolis, consult. engrs.

Mo., Clarksville—City, P. E. Hamilton, clk., 8- to 15-in. sanitary sewers, pump. station, etc. **$100,000.** E. C. Meyers, c/o Meyers & Foster, 2690 Big Bend Blvd., St. Louis, Zone 17, consult. engr.

Mo., Vinita Park (St. Louis 14, P.O.)—Village, c/o Clerk, Village Hall, 8- to 18-in. sanitary sewers, outlet connections, etc. **$150,000-$160,000.** E. C. Meyers, c/o Meyers & Foster 2690 Big Bend Blvd., St. Louis, Zone 17, consult. engr. CD 8/24/45—ENR 9/6/45.

Neb., Lincoln—City, 1½ mi. sanitary sewers, Antelope Valley Dist. **$100,000.** D. L. Erickson, city engr.

O., Conneaut—City, sewage and refuse treatment plant. **$402,260.**

O., Dayton—Suburban Conservancy Dist. of Van Buren Twp., Montgomery Co., sanitary sewerage sys. addns. and sewage treatment plant. **$307,590.**

O., Fremont—City, voted **$700,000** bonds, sewage disposal plant. CD 4/15—ENR 5/1.

O., Lexington — City , sanitary sewerage sys., incl. sewage treatment plant. **$125,225.**

O., Manchester—City, sewerage sys. addns., incl. sewage treatment plant. **$241,000.**

O., Seamon—City, sewerage sys., sewage plant. **$150,000.**

O., Taylor—City sewerage sys. addn., sewage treatment plant. **$545,000.**

O., West Union—City, sewerage sys., pump. stations, sewage treatment plant. **$231,000.**

Pa., Avis—City, sewerage sys., incl. primary sewage treatment plant. **$152,000.** CD 2/7/45—ENR 2/22/45.

Pa., Duncannon—Duncannon Boro, sanitary sewerage sys. **$106,000.**

Pa., Hellertown—Hellertown Boro Authority, sanitary and storm sewers. **$100,000.**

Pa., Oil City—Comrs. Cornplantic Twp., R.D. 1, Oil City, sanitary sewerage sys., disposal plant. **$166,000.** Hill & Hill, 24½ E. Main St., Northeast, consult. engrs.

Pa., State College — State College Boro, sanitary sewerage sys. **$383,950.**

Pa., State College — State College Boro, storm sewers. **$115,636.**

Tex., Dickinson—Galveston Co. Water Control & Imprvt. Dist. 1, Charles H. Garner, pres., sewer facilities addn. **$100,000;** sewerage sys., **$111,000;** sewer lines, **$41,000.** J. J. Rady, 811 Insurance Bldg., Fort Worth, consult. engr.

Tex., Higgins—City, sanitary sewerage sys. imprvs. **$150,000.**

Tex., Vidor—Orange Co. Water Control & Imprvt. Dist., sewage disposal plant, **$75,000;** storm sewers, **$125,000** tentative; sanitary sewers, **$200,000** tentative. Koch & Fowler, Great Natl. Life Bldg., Dallas, consult. engrs.

Tex., Wharton—City, F. S. Haines, mayor, sewerage sys. **$212,630.** Wyatt C. Hedrick Co., 5201 Fannin St., Houston, Zone 4, consult. engr.

W. Va., Weston—City, sewage disposal plant. **$400,000-$500,000.**

Wyo., Cheyenne—City, sewage plant. **$816,000.** Black & Veatch, 46-7 Broadway, Kansas City, Mo., consult. engrs. H. G. Watson, city engr. CD 7/1—ENR 7/25.

Wyo., Cheyenne—City, storm sewerage sys. **$350,000.** T. H. Baldwin, City and County Bldg., consult. engr. H. G. Watson, city engr. CD 2/28/45—ENR 3/8/45.

Wyo., Laramie—City, storm sewers, appurtenances in residential area near University of Wyoming, **$119,000;** sanitary trunk lines, **$54,960;** sewage treatment plant, **$220,300.** Person & McGaw, Laramie, engrs. C. O. Anderson, Laramie, city engr. CD 2/5/46—ENR 2/21/46.

BRIDGES

PROPOSED WORK

Kan., Kansas City—City, H. Payne, clk., reconstructing western 900 ft. of Central Ave. viaduct. **$380,000.** Sverdrup & Parcel, Syndicate Trust Bldg., 917 Olive St., St. Louis, Mo., consult. engrs.

Pa., Danville — Danville Boro, highway bridges. **$160,000.**

British Columbia—Dpt. P. Wks., Victoria, overhead bridge on Trans Canada Hy., Abbottsford. Approx. **$125,000.** H. Anderson, c/o owner, engr.

STREETS AND ROADS

PROPOSED WORK

Colo., Louisville—City, street paving, curbing, guttering, appurtenant work. **$140,000.**

Ill., Moline — City, E. H. Sohner, mayor, imprv. various streets downtown area, concrete paving, curbing, storm drains, etc., Sect. 40-CS, **$100,000;** imprv. 4 Ave. from 6 to 15 Sts., Sect. 41 CS, **$109,000.** William M. Coopeman, City Hall, city engr.

Ia., Sioux City—City, F. Montgomery, supt. streets, City Hall, asphaltic concrete and concrete resurfacing, reconstructing main arterial streets. **$393,000.** Tom Russell, City Hall, city engr. CD 5/9/44—ENR 5/18/44.

La., Cameron—Cameron Parish, J. W. Doxey, secy., road imprvs. **$292,000.** J. B. Converse & Co., Inc., Port Arthur, Tex., consult. engr.

Minn., Watertown—Village, M. M. Lundquist, clk., 45,000 lin. ft. concrete curb and guttering; 22,500 ft. concrete flooring, 44,000 lin. ft. concrete sidewalks, and 7,500 lin. ft. concrete curb. **$196,000.** Hitchcock & Estabrook, 521 Sexton Bldg., Minneapolis, consult. engrs.

Mo., Berkeley—City, c/o Bd. Aldermen, City Hall, Airport Rd., and Helen Ave., Berkeley, St. Louis, Zone 21, north and south hy. through city from Springdale Ave. to Hy. 66. **$170,000.** Russell & Axen, 6635 Delmar Blvd., University City, St. Louis, Zone 5, consult. engrs. CD 5/20—ENR 5/30.

Nebraska—Richardson Co., Falls City, and Pawnee Co., Pawnee City, rebuilding 6 mi. secondary road near Humbolt. **$110,000.** W. G. Scott, state engr., Lincoln, consult. engr.

N. J., Trenton—City, paving Paul Ave., etc., over **$50,000;** Mulberry St., **$60,000.** J. E. English, Trenton, city engr.

Pa., Hellertown — Hellertown Authority street repairs. **$224,549.**

★**Tex., Alice**—Comr. Jim Wells Co., bond election June 7, road construction 83.2 mi. Prec. 1, **$874,000;** 51 mi. Prec. 2, **$326,000;** 64.- mi. Prec. 3, **$281,200;** 102.6 mi. Prec. 4, **$913,000.** Bond election May 24 postponed. CD 5/9.

Tex., Jasper — City, V. L. Mays, mayor, street paving, **$200,000;** sewerage sys., **$75,000.** Garrett Eng. Co., 1806 Milam St., Houston, Zone 3, consult. engr. CD 2/15/45—ENR 3/8/45.

Tex., Liberty—City, O. F. Campbell, mgr., street paving. **$321,000.** Garrett Eng. Co., 1806 Milam St., Houston, Zone 3, consult. engr. CD 9/21/44—ENR 10/5/44.

Tex., Mathis—San Patricio Co. Road Dist. 4, voted bonds, farm-to-market road imprvs. **$180,000.**

Tex., Monahans—City, E. D. Duffy, mayor, voted bonds, street imprvs. and hard-paving. **$300,000.**

Wash., Cashmere—City, City Hall, widening, exten. Cottage Ave. **$250,000.**

Ont., Mille Roches—Cornwall Twp., V. A. McDonald, clk., Mille Roches, roadwork throughout township in 1947. Approx. **$250,000.**

EARTHWORK, WATERWAYS

PROPOSED WORK

Ark., Pine Bluff—Waterloo Drainage Dist. of Jefferson Co., A. E. Triplett, atty., Pine Bluff, drainage sys. imprvs. **$164,380.** Arthur E. Heagler, 315 Exchange Bldg., Little Rock, consult. engr. CD 12/12—ENR 12/26, under Ark., Waterloo.

Tex., Newton—Soil Conservation & Reclamation Dist., Jasper and Newton Counties, Newton, drainage, earthen tanks, revetments, protective levees, ditching. **$200,000.**

Tex., Texas City—Monsanto Chemical Co., Texas City, plans under way plant area grounds development, incl. clearing entire area, grading, leveling grounds, excavating, removing old rein.-con. fdns. **$100,000;** constructing waterlines, steam lines, sewers and outside area lighting system, **$75,000.**

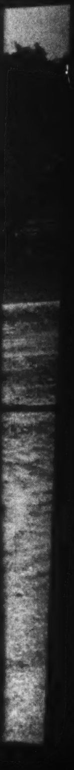
Wash., Montesano—Grays Harbor Co., Courthouse, channel imprvs. on Chehalis River, **$81,000.** Humptulips, **$65,000.**

B. C. Esquimalt—Dominion Govt., Ottawa, Ont., canal from Esquimalt harbor and Portage Inlet to provide the Gorge and Portage Inlet with better circulation. **$100,000.** Dpt. P. Wks., Hunter Bldg., Ottawa, Ont., engr.

F

M

A

Possib
constr
and c
strat
"oper
of